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POPULAR SCIENCE

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PATENT PENDING
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J. M. Watt
PRESIDENT
LIFE-LONG BATTERY MFG. CORP.

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INSTALL IT YOURSELF AND SAVE!

It's easy! Just mark a straight line through the center of your room in both directions, using a chalk and line. Be careful not to cover up your guide lines.

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POPULAR SCIENCE
REG. U. S. PAT. OFF. Monthly

Mechanics and Handicraft
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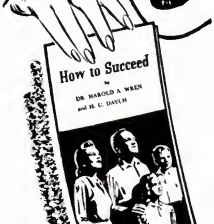
L. P. S., Elkhart, Ind.



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No. 221A

Fastens Leaders • Skins Fish
Removes Hooks • Attaches Sinkers
Makes Flies • Repairs Reels, Engines, etc.

As indispensable as a knife, the new PROTO Fisherman's Plier makes your outdoor sports far more fun. You'll love its extra-heavy chrome-plating for resisting rust; its hardened cutting edges that snip tough leaders with ease; its thin needle nose for repairing tackle and removing hooks; and the attractive fish-knurling on the handles for a sure grip, even with wet hands. A belt sheath of saddle leather keeps the tool instantly available, and a safety flap prevents loss. The Fisherman's Plier is made of special steel and has the same *Professional Quality* for which all PROTO tools are famous. Buy one now from your PROTO dealer. It's the ideal gift for a friend ... *or* yourself! Send 10¢ for 68-page catalog showing the entire PROTO line to

PLOMB TOOL COMPANY
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5497

PROTO® TOOLS
PROTO means PROfessional TOols

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He's using the telephone that lends an extra hand

"Sure . . . I'm looking up the figures right now!" From busy executives to clerks, people in business can work more easily and efficiently with Bell's new Distant Talking Telephone. Small white rectangle is the loudspeaker.

For people who want to keep *both* hands free when they telephone, Bell Laboratories engineers have devised a new telephone with a sensitive microphone in its base.

To use it, simply press a button. The microphone picks up your voice and sends it on its way. Your party's voice comes to you through a small loudspeaker. Both of your hands are left free!

The volume can be adjusted to suit yourself. If privacy is needed, simply lift the handset; this shuts off the microphone and loudspeaker and you talk as on a regular telephone.

This new development of Bell Telephone Laboratories increases the number of ways your local Bell telephone company can serve in businesses and homes.

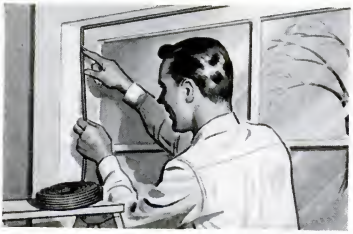
Pencil points to microphone in base of new telephone. Left-hand button controls volume, center one turns set "on" and lights up while in use. The third is an "off" button.

BELL TELEPHONE LABORATORIES

Improving telephone service for America provides careers for creative men in scientific and technical fields

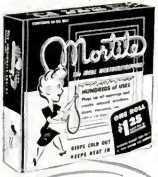
Weatherstrip with your fingertip

THE EASY **Mortite** WAY!



ELIMINATE UNHEALTHY, fuel-wasting drafts —Mortite your windows *now!* Weatherproofs a window *in seconds* at so little cost! Self-adheres—no tacks or tools—just press in place!

SOFT, ROPE-LIKE STRANDS. (¼" diameter), unroll like ribbon, mould into place like modeling clay. Use inside or out—no need to go out in cold to apply. Won't crack, chip or peel. Use over and over—in Spring, hold one end, pull right off. 1,001 other uses! Ideal as gasket, caulker, base for flower stems. Perfect plugger-upper for variety of uses in, around home all year long!



KEEP Mortite HANDY

Available At All Leading Stores. Send For Your FREE Circular Showing Mortite Uses In, Around Home!

29¢ · 98¢ · $1.25

JW **Mortell** COMPANY

Serving The Home and Industry Since 1895

534 Burch St. **KANKAKEE, ILL.**

Letters

Raising a Shop Family

What kind of satisfaction has Reader Kays achieved by chasing the wife and kiddies from his hobby shop by means of "racy" pictures on the walls (June, p. 18)?

We're a hobby family (model railroading, tropical fish, crafts, etc.) and will be the first to admit that our three-year-old is more of a hindrance than a help in the shop. But we're learning a priceless lesson of self-

control and are on the road to achieving family unity. The three-year-old has his scaled garden and shop tools and is assimilating all sorts of skills.

MR. AND MRS. JAMES BRADY, Reseda, Calif.

A Blood Feud Is Settled

In September ["Letters," p. 12], you apologized quite without warrant for having stated that "As the air gets rarer, the blood gets redder."

Your correspondent confused air with oxygen. People living in high altitudes have an increase in the number of red blood cells per unit of blood volume. Hence, the blood *does* get redder.

Please correct your correction!

IAGO GALDSTON, M. D.,
N. Y. Academy of Medicine, New York

Says the U. S. Air Force School of Aviation Medicine, Randolph Field, Texas:

"Your statement was correct if, by 'redder,' you meant darker red. Your original critic likewise was correct if, by 'bluish,' he

1955 is our **25th** *anniversary year.*

"OWN a Business" Coupon

DURACLEAN CO., 4-18D Duraclean Bldg., Deerfield, Ill., U.S.A.
Without obligation to me, send booklet and letter giving full details. Tell me how I may OWN a growing business of my own built upon satisfied customers.

Name_____

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Start Now . . . while employed

Are You The Man?

If you have longed for the prestige and financial independence of YOUR OWN business, you can now realize this desire . . . if you are qualify for a Duraclean dealership. We are now enlarging this 24-year-old chain of independently-owned service dealerships which has rapidly grown to a world-wide service.

You must however be reliable, honest, diligent, and able to make a small investment in a business of your own . . . a profession for which we will personally and quickly train you. If needed, we will help finance you.

We want to assure your success. A Duraclean dealer will train and assist you. He'll reveal his successful plan of building cutomers. He will **work with you.** This business is **easy to learn** . . . quickly established.

This is a sound, lifetime business that grows from REPEAT ORDERS and customer RECOMMENDATIONS. Alert dealers can gross an hourly profit of $5.00 on own service plus $3.00 on EACH service-man at National Price Guide charges. Mail coupon **today** for full details.

You are Trained in a New Profession ... to Revive, Clean, Protect Home Furnishings

You have the opportunity to steadily increase the income for your family month after month and year after year without waiting for a raise. Duraclean dealers enjoy unusual profit on both materials and labor . . . after paying servicemen or salesmen. Service is rendered IN the home. Some have shops or offices . . . others operate from their home with no overhead expense. No experience is needed. We show you 27 ways to bring customers to you.

Our **MUTUAL COOPERATION program** gives you many unique and continuous advantages **after** you are established as your business grows. For example, **National Advertising.** YOUR services are advertised in magazines like Better Homes & Gardens, Life, McCalls, House & Garden, Maclean's (Canada) and a dozen others, **World-wide.** Dealerships throughout the world. **Copyright** and **trademark** protection. **Certificate** approves equipment and materials. **Products Insurance. Six-year Warranty. Pocket Demonstrators. Sales Book. Advertising Folders & Cards. Tested Ads. Ad Cuts & Mats. Store Display Cards. Radio & TV Musical Commercials. Booth Display** for YOUR Home Show or Fair. **Publicity Program** gets FREE local newspaper stories. **Prizes** awarded dealers. **Laboratory** develops current products, conducts research on NEW products, etc. **Duragram** bulletins (32 in past 12 mos.) cover every conceivable topic. **Resale Service** helps dealer (moving, drafted, etc.) sell his business. **Annual Conventions. Headquarters.** Behind all this is a Hdqs. interested in YOUR personal success.

Almost every building houses a customer needing one or both services. Furniture stores, department stores, interior decorators, upholsterers and carpet stores develop Duracleaning and Duraproofing jobs from their customers. Auto dealers take orders and have used cars Duracleaned. You have a high hourly income from the day you start . . . even while still employed.

What Dealers Say

Fuller Munroe: "I give full time to estimating and supervising. We average $9 hourly income per service man, but one man today produced $118.00."

T. Komari (Japan) "Have 1,000,000 yen contract Duracleaning for U.S. Army."

W. Lookiehill: "We've had 20 years of pleasant dealings. I'm 65 but am setting my sights for 20 more years."

P. Freidinger: "Had a big moth-proof business last year; one job was $322.25."

R. Kimbrough: "Finished First White House of Confederacy and am to Duraclean the Governor's Mansion."

H. Satterfield: "Duracleaned chair for largest department store and got order for 60 to 75 chairs, couches and davenports."

E. Schenk: "The customers I had on **House and Garden** ads were very pleased. Their furnishings came out beautiful."

A. Ullman: "It is very encouraging that every demonstration has been a sale."

L. Johnson: "Each customer leads to 3 or 4 more. One job two of us cleaned $125 worth in 5 hours."

More quotations in our literature.

Duraclean Revolutionizes Old Methods

Duraclean's growth to a world-wide service resulted from **customer convenience** plus its **many superiorities** over ordinary cleaning. Housewives, clubs, hotels, offices and institutions deeply appreciate not having furnishings out of use for days and weeks.

They are thrilled to see their upholstery and floor coverings cleaned and revived with a **new consideration for its life and beauty.** Duraclean doesn't merely clean . . . it restores natural lubrication to wool and other fibers. Colors revive. The re-enlivened rug and carpet pile unmats and rises.

Aerated foam created by the electric Foamovator (right) banishes dirt, grease and many unsightly spots . . . **without scrubbing.** Customers tell friends how Duraclean has eliminated customary soaking, shrinking and breaking of fibers from scrubbing . . . how the mild quick action foam, lightly applied, provides safety from color runs and roughened fabric they have previously experienced . . . how fabrics look fresher, brighter, cleaner . . . how convenient it is not to have furnishings gone.

They appreciate the courteous, personalized service of Duraclean craftsmen. Such service is NEWS . . . it spreads to friends and neighbors. Customers become your best salesmen.

Duraproof: This companion service not only kills moths and carpet beetles . . . it is WARRANTED to make fabric repellent to both. Damage to household goods and wearing apparel is greater from moths than fire. This modern treatment PROTECTS rugs carpets, upholstery, furs, clothing, blankets, piano-felts, auto-interiors, etc.

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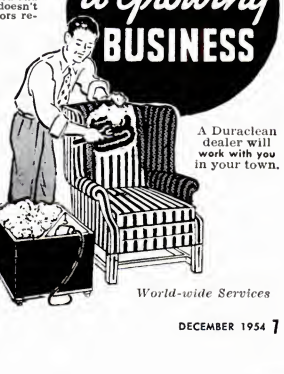
DURACLEAN CO., 4-18D Duraclean Bldg., Deerfield, Illinois



meant a purplish red. What actually happens is that the blood, normally bright red, becomes darker with oxygen deficiency at high altitudes."

Laments for the Model A

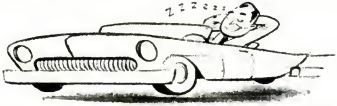
Frank Rowsome's "A Lament for the Model A" [Sept., p. 172] is one of the best articles I've read. It was also very expensive for me: I went out and bought one.

It's a great car, but it took me a couple of days to find out that you can't signal turns with the spark lever and can't throw the gas lever into second gear.

Please, don't let Rowsome write about the Model T—I just can't afford it.

HANS C. JENS, Ypsilanti, Mich.

You can say one thing for the Model A: it had to be *driven*. Today's plushy push-



carts are designed for incompetents who are no more capable of driving a car than a B-29. These portable lounge rooms are built for sleeping, not driving.

H. N. WEBSTER, Nutley, N. J.

Discussed Frank Rowsome's article with my teen-age son. I was informed that the Model A was a loose caboose with a dead head, an ignition that delivered a mock shock, a fickle vehicle with centipede speed.

Let me say that my ire's afire.

To work on a Model A you didn't have to be an acrobatic fanatic or an organic mechanic to keep it running cunning. Its simple performance promoted a cool drool instead of a power glower and an insane brain. The jerk it started with wasn't behind the steering wheel.

You youngsters can sorrow for the car of tomorrow; we bolstered oldsters have had it.

W. M. LIDWELL, Corpus Christi, Tex.

On my first A, a friend showed me how the shift lever would lift up and swivel against the dash from either neutral or third-gear position. So against the dash was where I had it one Sunday afternoon with four people in the front seat.

Then I hit a hill that called for second

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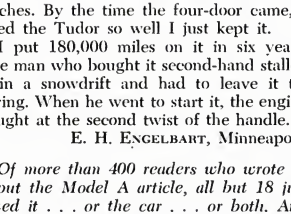
gear. I released clutch, revved motor and grabbed for shift lever—but all I found was a bare knee. I made another pass, got another knee.

We were wedged in so tightly that the startled girl couldn't get a full swing at me.

FRANK D. HAMMER, Altadena, Calif.

My Model A was the first delivered in the little Minnesota town of Cannon Falls. It caused such a sensation that the dealer talked me into letting him keep my Tudor as a demonstrator in return for a four-door later. Together we ran through frozen corn fields at 60 miles an hour, fairly leaping the



ditches. By the time the four-door came, I liked the Tudor so well I just kept it.

I put 180,000 miles on it in six years. The man who bought it second-hand stalled it in a snowdrift and had to leave it till spring. When he went to start it, the engine caught at the second twist of the handle.

E. H. ENGELBART, Minneapolis

Of more than 400 readers who wrote us about the Model A article, all but 18 just loved it . . . or the car . . . or both. And most of them told tales of their own Model A's, often fondly remembered as Liz, Betsy, Lena, Josephine, Genevieve, etc.

Do people still give their cars names?

Unusual Weather

The map on pages 114-115 of your November issue shows the Southwest as wet states and the southeastern states as dry. Isn't that just backwards?

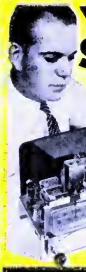
WILLIAM GORDON, Stamford, Conn.

Exactly backwards—due to a pair of carelessly transposed captions.

Furnace vs. Boiler

We thought your comprehensive article "What's New in Home Heating" [Oct., p. 149] was excellent—with one exception: you apparently are using the term "furnace" to cover home-heating boilers as well.

Actually, a furnace is used only with so-called warm-air heating systems, in which



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"I've come a long way in Radio and Television since graduating. Have my own business on Main Street."—Joe Travers, Asbury Park, New Jersey.

"I didn't know a thing about Radio. Now have a good job as Studio Engineer at KMMJ."—Bill Delzell, Central City, Nebraska.

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air heated in the furnace is forced through ductwork into the house. A boiler, on the other hand, is used with so-called wet-heat systems, in which water is heated in the boiler and forced through very small pipe into baseboard, radiators or convectors.

R. E. TERRY,
Inst. of Boiler and Radiator Mfrs.,
New York

Ouch, That Careless Artist!

In "Keeping the Basement Shipshape" [Sept., p. 125], there is an item about installing a buzzer in the cellar. Maybe the idea is a good one, but the picture of the man watching the buzzer, and taking his eyes from a saw which is running, gave me the willies! Let's hope the artist still has all his fingers.

JOHN LACY, Philadelphia

Exposing a Heavenly Hoax

Not long ago I read in the papers that two meteorites have become satellites of the earth and are revolving around us—one 400 miles out in space, the other about 600.

This story sounded pretty weird to me, but it said the Air Force had got excited and sent Dr. Lincoln La Paz of the University of New Mexico dashing over to Palomar Observatory in California to check up. Dr. La Paz reportedly identified the objects as meteorites and not man-made satellites.

Can this story possibly be true?

WOODRUFF DUNHAM, Oakland, Calif.

POPULAR SCIENCE MONTHLY *had representatives run this report down.*

First, the Air Force declared that it wasn't the least bit excited about any satellite meteorites now, and never had been.

Second, the University of New Mexico reported that Dr. La Paz said the story was "a complete hoax."

Third, Dr. Milton Humason, secretary of Mt. Wilson and Palomar Observatories, said that Dr. La Paz had not visited Palomar.

Astronomers generally were pretty contemptuous of the printed story, since none of them had ever seen a natural object like those described, and they were not at all convinced that any man-made object, at this stage of the game, could perform in the orderly fashion described in the press.

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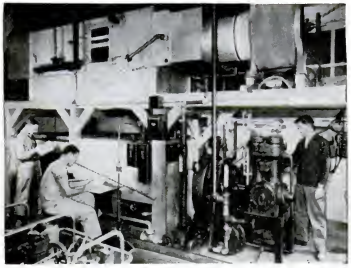

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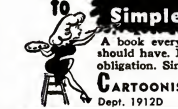

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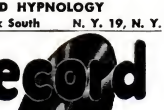

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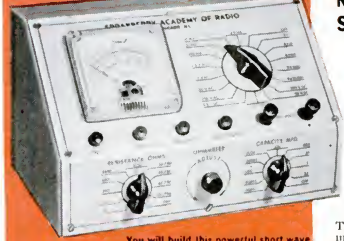

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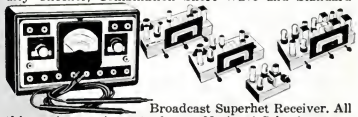

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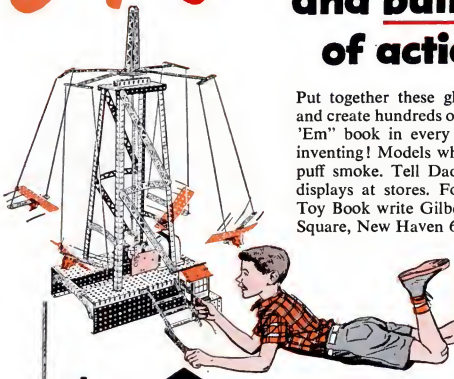

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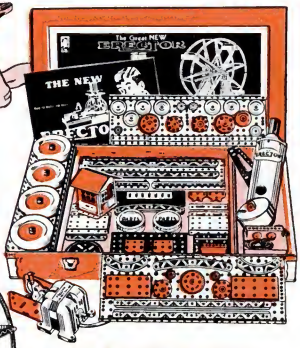

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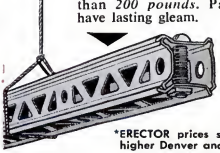

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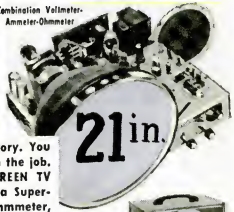

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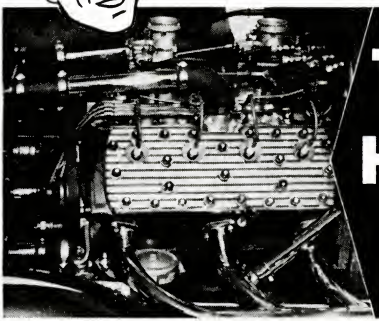

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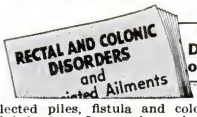

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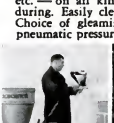

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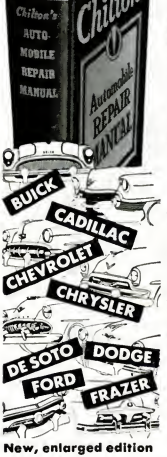

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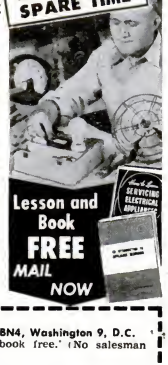

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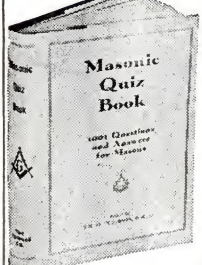

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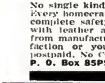

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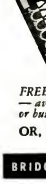

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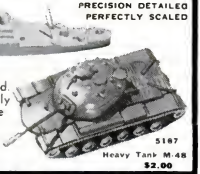

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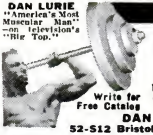

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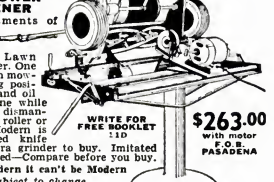

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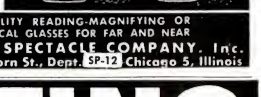

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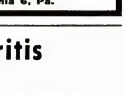

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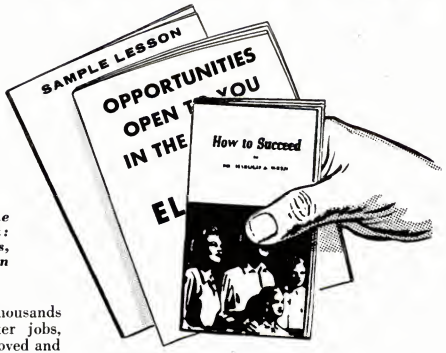

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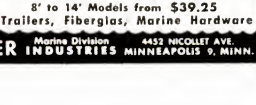

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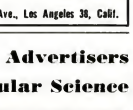

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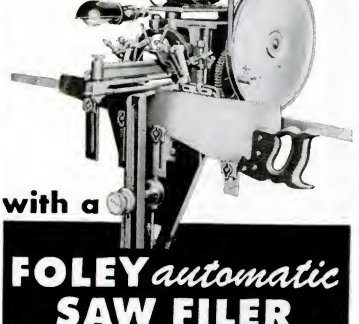

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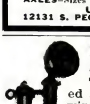

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650x16(6)	7.05	710x15	5.25	750x17	10.55	825x20	17.55
700x16	8.15	760x15	5.75	750x15	10.45	900x20	17.65
750x16(6)	8.35	800x15	6.05	825x15	10.45	1000x20	16.55
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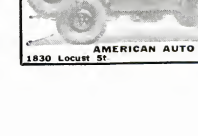

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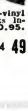

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SONGWRITERS! Protect your poems and songs! Don't mail anywhere! Write for safe procedure! Song Service, 333 W. 56th Dept. P.S., New York 19, N.Y.

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WANTED! Home Producers. by manufacturers in our Clearing House Service. Become subcontractor, casting plastic products for these companies. Thousands of easy-to-make items required for consumer-industrial use. Cash in at home, without previous experience. Plastic Service Associates. Dept. 12-PS, East Boston 28. Massachusetts.

TRADE Magazines. See late copies through our easy to get acquainted service. Choose from 4,387. covering all fields. Current List Free. Commercial Engraving Publishing Company, 34S North Ritter, Indianapolis 19, Indiana.

FREE booklet "Money Making Facts" tells mechanically-inclined men how to start sparetime business at home. Charles Foley Company, Columbia Heights, Minn.

NEW Mail Order Business—You mail catalogs. Factory ships orders. Big profits. 33 Catalogs $1. Factory, 41PS Rankin St., Newark 3. New Jersey.

MANUFACTURE vending machines which dispense choice of coffee, soup, or chocolate from one machine, in your home, shop, or factory. Material costs about $105.00. Sell $1000.00. Edward Heiller, 2362 Saratoga, Louisville, Kentucky.

"MAKE Perfumes", other products—Sell mailorder—Formula Catalogue Free. International, 6347 Parnell-PS12, Chicago 21, Ill.

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MAIL Order! Details free. Lexington Mail Service, 5511-B Monroe, Chicago 44.

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STAY Home—Sell Merchandise By Mail! Everything furnished. Orders filled. Big earnings. National, Box 88-B, Dorchester 22, Mass.

PROFITABLE mail-order Import business. Send $1.00 for imported gift worth $2.00 and free details. Transamerican, Box 815-B, Atlanta 1, Georgia.

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MONTHLY repeat business which you can operate in your own community. For free details write Crissack, 321—28th Street, McKeesport, Pennsylvania.

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38 MONEYMAKING OPPORTUNITIES

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ADDRESS advertising postcards. Extra Cash Daily. Box 5022, Tampa 5, Florida.

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42 HELP WANTED

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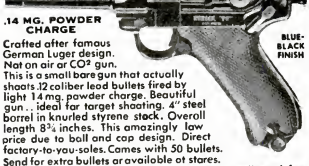

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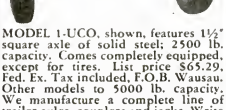

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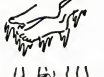

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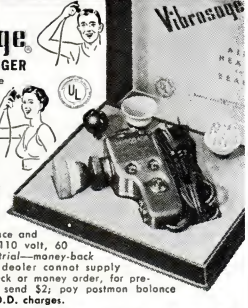

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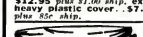

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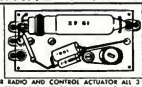

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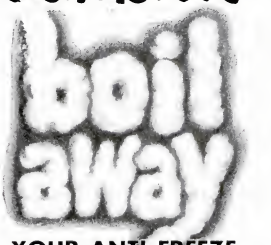

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POPULAR SCIENCE MONTHLY'S . . . **Last-minute news & notes**

TINY ROCKET MOTORS ON THE TIPS OF HELICOPTER BLADES are being tried by the Marines. The power boost from the one-pound rockets can double take-off payload under some conditions. Called ROR (for rocket on rotor), they burn hydrogen peroxide. Reaction Motors, Inc., developed them...A RECORD-SHATTERING HIGH SPEED--for helicopters, that is--was reached by a Sikorsky XH-39 when it hit 156 m.p.h. recently.

COLOR TELEVISION CAN NOW COVER MOST OF THE COUNTRY. AT&T's cables and radio relays will by year's end serve 95 cities having 125 color-equipped stations...WILKES-BARRE, PA., WILL HAVE THE COUNTRY'S MOST POWERFUL TV STATION--a million watts by next month...DIAMOND PROSPECTORS ARE USING URANIUM HUNTERS' INSTRUMENTS--but in reverse. Where radioactivity drops, diamond veins are likely...A PREFAB HOUSE GABLE--the whole gable end--simplifies building small homes. It's really a giant steel louver, made in sections. Maco Corp., Huntington, Ind., is the manufacturer...TOMATO POWDER that becomes tomato juice, paste or puree when you add water has been developed by the Agriculture Department...BOATS AREN'T RICH MEN'S TOYS any more. The Scott-Atwater outboard firm counted pleasure boats, found a grand total of 5,500,000...EARMUFFS FOR SPORTS-CAR FANS? A special windscreen to keep wind noises from interfering with sounds you want to hear was invented for the Air Force, but it looks mighty handy for listening to the radio while you drive with the top down. That's it at left--a wire-screen cup covered with nylon and attached to an earphone cushion and headband. The inventors, J.R.M. Hayes and A.L. Cudworth of MIT, add: "In addition, it keeps the listener's ears warm."

YOU'RE A NEW MAN EVERY YEAR--98 percent of the atoms in your body are replaced by new ones in 12 months, radioisotopes show...A NEW MACHINE CALLED THE SOMASCOPE peeks inside your body to make X-raylike pictures of internal soft organs, including cancers. Dr. Douglass H. Howry, working with the Veterans Administration, invented it...A NEW BANDAGE DOES NOT STICK TO WOUNDS, comes off painlessly. Bauer & Black's Telfa is made of nonwoven cotton fabric backed with Mylar plastic.

How Researchers Solved

Detroit's Biggest Problem

...their ingenuity may make your present engine last years longer and save you hundreds of dollars in repairs.

THEORETICALLY, YOUR ENGINE should never wear out, because the moving parts never touch each other. They're always separated by a thin film of oil. The problem is to keep abrasive particles out of that thin film of oil. That problem has become tougher every year since the Model T, as engine clearances have become finer and speeds higher.

Today, abrasive particles comparable to the thickness of the ink on this page may do hundreds of dollars of damage to your engine!

Because hot oil, under pressure, often forces "channels" in rag or paper filter packs, these abrasives get through. That's why a team of researchers developed a new material for oil filters: porous bronze.

This new filter material is made of millions of microscopic balls fused together. No amount of oil can force a channel in it. No dangerous abrasive particles can get through. It doesn't soak up valuable oil additives as absorbent filters do. *And you never change it!* You simply rinse it in gasoline and keep on using it for 10,000, 100,000 and more miles of driving. It's called the Life-Time filter.

The cost? About the same as a couple of throwaway filter packs. In addition to saving the cost of filter pack replacement, you save the quart of oil soaked up and thrown away with ordinary filter packs and – most important – you save money on engine repairs by filtering out dangerous abrasives.

OPPORTUNITY FOR DEALERS AND DISTRIBUTORS

A dealer and distributor network is now being formed to handle demand generated by advertising and editorial features in national magazines. If you can qualify, you can be first with the most exciting automotive product of this decade, to win new customers and build a substantial business. These valued franchises are not being sold; they are awarded on the basis of ability to grow with us. For complete details, write or wire: Continental Manufacturing Corporation, Dept FPS-12, Washington Blvd. & Motor Avenue, Culver City, Calif.

Evolution of Bronze Filter Design

1. "Tin Can" **2. Rigid Cone**

1. First crude attempts to design a bronze filter simply imitated the shape of the ordinary throwaway pack. Because of its basic structural weakness and the danger that sediment packing between the element and the case might critically reduce oil pressure, all attempts to "improve" this design were abandoned, even though it was relatively cheap to manufacture.

2. After considering almost every geometric shape, the cone was selected as the most rigid and was used for the Life-Time filter. This design also allows the sediment to drop to the bottom of the case, clear of the element. It has withstood the ultra-sonic vibration test and the 100G shock test. Only the Life-Time filter uses this exclusive cone design; it is fully protected by patents.

HOW TO GET A LIFETIME FILTER FOR YOUR CAR

Try the Lifetime filter on your car for 2 weeks: if it isn't all I say, you get your money back; if you keep it, you're through buying filter packs—the Lifetime filter is guaranteed for 10 years, actually will last many times that long.

For complete unit, including case (install on any car in 10 minutes), send make, year and model of your car and $12.95 (we pay shipping).

Conversion kit, which replaces your present filter pack with Life-Time bronze, is $6.95 for most cars (send make and number of present filter when ordering). Conversion kits for Buicks with hydraulic lifters and for cars with full flow systems: $13.95.

Or send only $2 deposit, pay C.O.D. charges on arrival. But do it today—don't waste another cent on filter pack replacements!

Complete Lifetime Filter; fits any car.

Lifetime Conversion Kit; replaces ordinary packs with permanent bronze element.

Permanent Filter Division, Dept. FPS-12
CONTINENTAL MANUFACTURING CORP.
Washington Blvd. at Motor Ave., Culver City, Calif.

Ship ☐ complete unit for_____
make, model, year of car

☐ conversion kit for_____
make and number of present filter

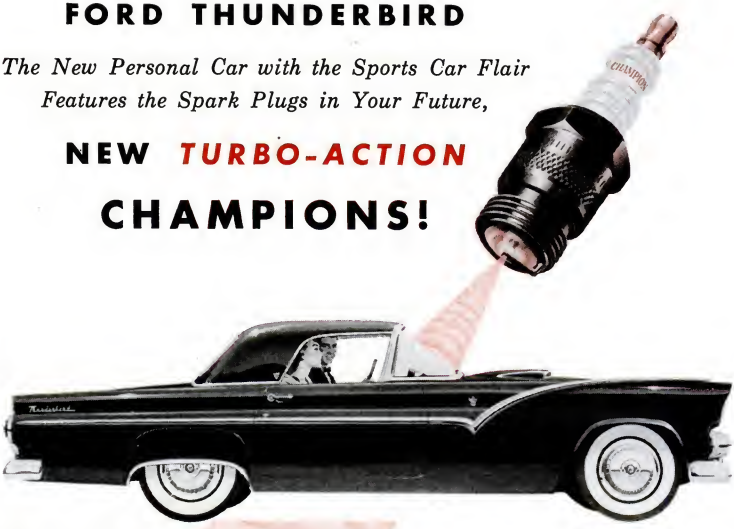
I enclose ☐ $12.95 for complete unit ($18.95—chrome)
☐ $6.95 for conversion kit (full-flow, $13.95)
☐ $2.00 deposit; send C.O.D.

Name_____
Address_____
City_____ Zone____ State_____

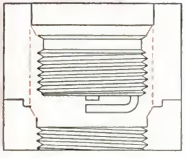
FORD THUNDERBIRD

The New Personal Car with the Sports Car Flair
Features the Spark Plugs in Your Future,

NEW *TURBO-ACTION* CHAMPIONS!



Greater clearance in the firing end permits turbulent gases to keep the insulator free of harmful deposits. Heat range, the temperature zone in which spark plugs operate efficiently, is extended to the widest limits in automotive history to meet the requirements of new, high-output engines.



Exclusive tapered Turbo-Action seating design forms a positive lock with a mating surface in the cylinder head without using a gasket. Correct installation is automatic and Turbo-Action Spark Plugs remain firmly fixed and accurately positioned in the combustion chamber.

The spark plug in your future is definitely the new Turbo-Action Champion which powers the mighty Ford Thunderbird.

So superior is the performance of this new Champion in the very latest design, high-output engines that other leading automobile manufacturers soon will follow the Thunderbird in adopting it as standard equipment.

Besides overcoming the number one problem of modern high-compression engines—fouling at continual low-speed driving—Turbo-Actions clear the way for higher compression, higher horsepower engines of the future.

Because of their new seating design and larger thread size, Turbo-Action Spark Plugs will fit only those new engines designed for them.

Your present car, however, will continue to give you top performance with regular standard Champions.

AVAILABLE AT FORD AND OTHER CHAMPION DEALERS

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

POPULAR SCIENCE
REG. U. S. PAT. OFF. Monthly

Army Trucks Walk Tight Wires

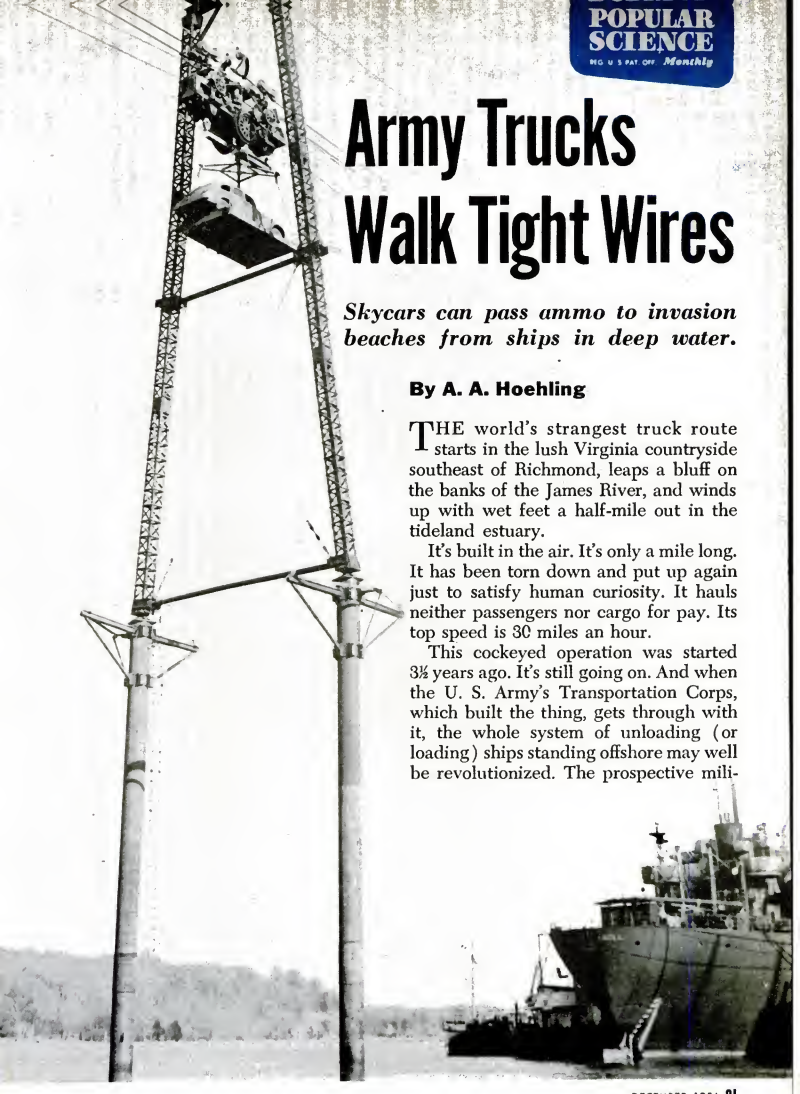
Skycars can pass ammo to invasion beaches from ships in deep water.

By A. A. Hoehling

THE world's strangest truck route starts in the lush Virginia countryside southeast of Richmond, leaps a bluff on the banks of the James River, and winds up with wet feet a half-mile out in the tideland estuary.

It's built in the air. It's only a mile long. It has been torn down and put up again just to satisfy human curiosity. It hauls neither passengers nor cargo for pay. Its top speed is 30 miles an hour.

This cockeyed operation was started 3½ years ago. It's still going on. And when the U. S. Army's Transportation Corps, which built the thing, gets through with it, the whole system of unloading (or loading) ships standing offshore may well be revolutionized. The prospective mili-



tary application is obvious: Set up in a few hours after invasion of a hostile beach, the tramway could speed guns, munitions and other heavy equipment ashore. Tides and rough water, bane of shallow-draft landing ships, would be of little hindrance to a cableway standing solidly spread-legged in the roiling water of the beach shelf.

Or it could temporarily replace some of the port facilities of a city with a waterfront badly damaged by wartime bombs.

A product of the corps' Transportation Research and Development Command at Ft. Eustis, Va., the aerial truck was built—the first time—in 1951 at Camp Wallace, Va.

TWIN SKYCARS ride the suspension wires independently, can transfer up to 160 tons an hour from ship to shore. Each car weighs eight tons, is 18 feet long, 11 feet high, five feet wide.

Trucks Ride Topsy-Turvy

It was the single-track type. Big overhead cables, supported by steel towers, provided the "track." On these cables were run skycars that could tote as much as 10 tons of cargo. The skycars were suspended from their roadway with their loads slung below them.

All kinds of cargo, from cases of food to big trucks, was plucked from barges or an LST moored in the estuary, swung high aloft, and trundled inland to a terminal depot. There, fork-lift trucks were used to remove it and store it away.

(Engineers are exploring the possibility of further streamlining at this point with a system of mechanical conveyors, to take cargo right off the skycars. Moving toward all parts of the depot, conveyors would speed up the sorting and storing of supplies.)

Engineers Double Up

When human curiosity led to dismantling and rebuilding the tramway, it was for a good reason. The engineers in charge wanted to know how their truck route would go if double-tracked. It was simple arithmetic that it would handle twice the cargo. It did.

The testing is still going on. Meantime, the people in charge have whistled up a companion idea. Why not design a self-raising, artificial "sea-island terminal" that the skycars can land on to pick up cargo? Then cargo ships would be independent of the trucks' capacity, taking on cargo or discharging it at the sea-island terminal at will.

That's what they are going to try next.

MID-AIR VOYAGE, with cargo riding on slung-under platform measuring nine by 18 feet, takes eight minutes for a mile. The nine 75-foot towers supporting the wire suspension ropes are anchored with guy cables. Safety devices include both air- and hand-brakes for car, a winch to raise and lower platform.

SUPPORT CABLES (EITHER ONE OF THESE 1 3/4" STEEL CABLES COULD SUPPORT CAR)

DRIVING WIRES (REEL IN AND DISCHARGE IN EITHER DIRECTION)

HOISTING WINCH (POWERED BY TAKE-OFF UNIT ON ENGINE)

BULL WHEEL (SPINS WIRE TO DRIVE CAR)

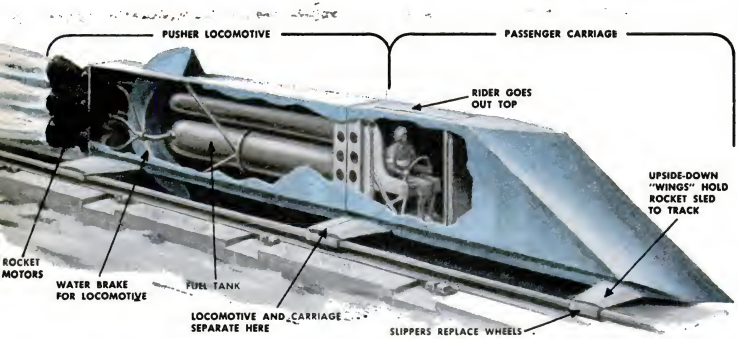
POWER IS SUPPLIED by a 180-horsepower gasoline engine turning a torque converter. This is supplemented by a mechanical forward-and-reverse transmission and speed-reduction gear. Traction and propulsion are provided by two driving wires anchored at terminals beneath suspension wires. They loop completely around "bullwheels" at each side of car. As engine turns bullwheels, they propel car by reeling in wire and discharging it at rear. At land end, cars come to rest at ground level, as shown here, for service and refueling. END

Firemen's Frolic: They Burn Down a Dynamite Factory

After 20 years of guarding Du Pont's dynamite plant at Gibbstown, N. J., company firemen were ordered to burn it down. The picture at right shows them watching the result. A hundred and twenty-five old wooden buildings were left unused when a new plant was built elsewhere. They had to be burned because so much high explosive had been ground into the floors, walls and loading platforms that wrecking them for scrap lumber would have been much too dangerous.

Rocket Car to Hurl Man

First dummies, then human beings, will take a nightmare ride to find how to bail out of tomorrow's supersonic warplanes.



CONTROL-HOUSE OPERATOR (below), at periscope window, stands ready to throw lever that fires rockets, starting sled and rider on way. On roof are warning lights, siren, loudspeaker.

AT LAUNCHING PAD, start of 10,000-foot-rail straightaway to cliff's edge, two-section rocket sled is towed from underground fueling pit and maneuvered into position to make its run.

Over Cliff

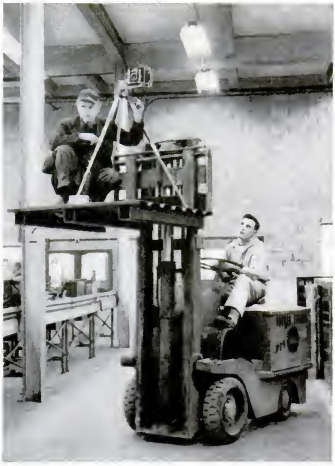
YOU sit in a car powered by roaring rockets. As it hits full speed, an explosive charge hurls you out. And you find yourself sailing through the air over a 1,500-foot precipice.

That nightmare is just what will happen in a $2,000,000 research project to develop ejection gear with which airmen can bail out safely from future supersonic U. S. warplanes.

Next year a rocket rail sled will begin runs on a two-mile straightaway to the edge of a Utah mountain flat. First it will pitch off dummies, then humans, to descend on chutes. Over the cliff goes the passenger carriage, too, its fall being checked by a chute of its own.—*Andrew R. Boone.*

TRACK ENDS in space. Locomotive stops—but the separable carriage races on, so as to reach ejection point at full speed, and then hurtles over cliff. Cameras in towers film the tests.

TELEVISION CAMERA rides truck to shoot Big Top Circus. Special platform rises 11 feet from ground level for bird's-eye view of performers and better close-ups of aerial shots.

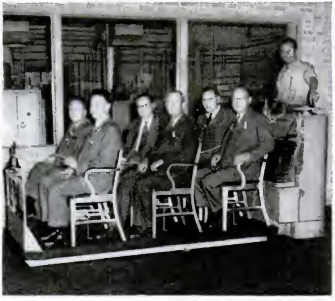


FACTORY LENSMAN squats seven feet up to photograph huge machinery. Able to move forward and backward, sideways, or up and down, the mobile perch cuts down shooting time.

Fork-Lift Trucks Get New Jobs, Work Harder at Old

FORK-LIFT trucks—industry's mechanical pack mules—are busier than ever. They turn up at track meets to lift officials to measure and replace pole-vault crossbars and appear at the Indianapolis Speedway to hoist cars for fast tire changes. Pictured are several engaged in other odd sidelines and one working harder at its own trade.

NO DRY RUNS with this truck. Instead of returning empty after a delivery, driver calls dispatcher on radiotelephone, then takes off in a beeline for a pickup.



ELECTRIC TRAIN takes visitors over the miles on an inspection tour of a new plant. Twelve fork-lift trucks, specially rigged for the job, stood by on opening day.

British Try Out Turbo-Tank

Visitors to a recent motor show in England got this peek (right) at what appears to be the world's first jet-powered tank. Officially, the British would say only that it is a "heavy tracked vehicle."

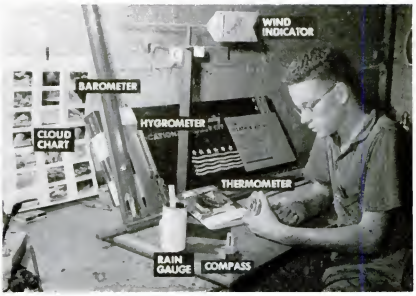
The power plant, made by the firm of C. A. Parsons, is a gas turbine with four combustion chambers. It can develop 1,000 horsepower.

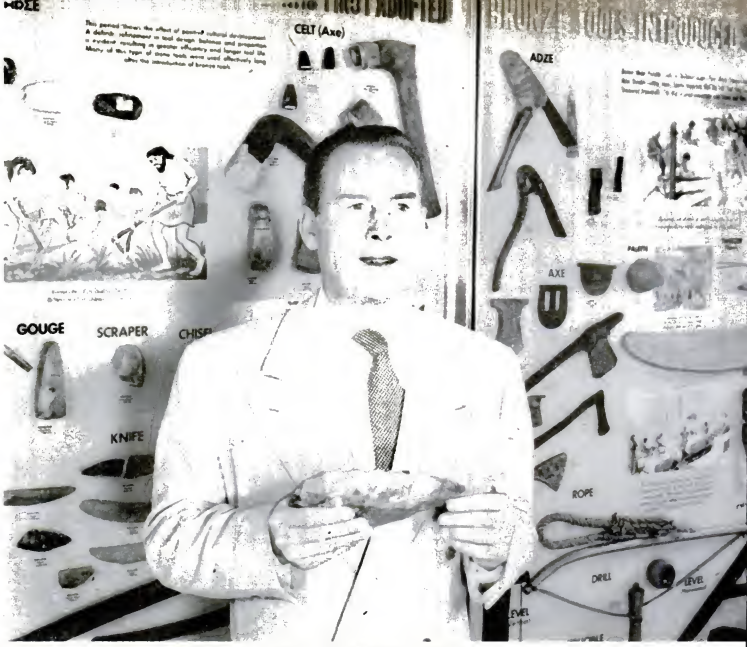
Tractor Replaces the Sled Dog

The Army is taking one of the last bits of romance from Arctic life with this pint-size tractor (below), intended to replace the husky at hauling sleds. The Ordnance Corps' Mechanical Dog has a four-cylinder Crosley engine and will mush at 10 m.p.h. The driver can ride or walk near the front and steer with the vertical lever.

Weather Station Built from Educational Kit

Kits prepared by some of America's most famous corporations will help youngsters have fun with science—and may attract more of them to professional careers. Five construction kits on weather (right), optics, electronics, geology and anatomy are available and more are being prepared in a program coordinated by American Industries, Inc., Merchandise Mart Plaza, Chicago 54.





Leighton A. Wilkie, tool historian, holds a 75,000-year-old fist ax found in a cave in France.

The Toolmaker Who Put a Museum on Wheels

Inventing machine tools made him wealthy—but he couldn't duplicate a dawn-age fist ax.

By Don Weldon

ON A secluded stretch of beach near Santa Barbara, Calif., a bronzed, lithe man in his forties kneeled to brace a flint rock on a boulder, and with a concentration that set his mouth in a determined line and swelled the veins in his temples, assaulted the flint with carefully directed blows from a second one he had picked up on the sand. It splintered into several small pieces. He stared hard at the ruins of his handiwork and then tossed the remnants away.

"I spoiled another one," he sighed.

His young son looked up from the sand crabs he was collecting in a milk bottle. "Dad, you've been whacking

stones together for two hours," he said. "If anyone saw you, they'd think you were nuts."

The man held his blistered hands thoughtfully before his eyes and ruefully shook his head.

"Michael," he announced, "your father is a failure as an ape man. If this were a million years ago, I couldn't for the life of me have made the most primitive kind of cutting tool—a fist ax. I've just proved that to myself."

Home Workshop—Cave-Man Style

Leighton A. Wilkie, a self-made machine-tool tycoon, did a lot of thinking about the evolution of tools as he drove his El Dorado convertible back to his lush estate in Montecito, where a fellow is considered a pauper if he has only *one* million. Although his paleolithic experiment had been dismally unsuccessful, he had gained a healthy respect for the imagination and the skill of the Pleistocene creature who invented and made the first rough stone tool—a rock with a purposely chipped cutting edge, which could be used for cutting, pounding, chopping, scraping, and grubbing, depending on how it was held in the hand.

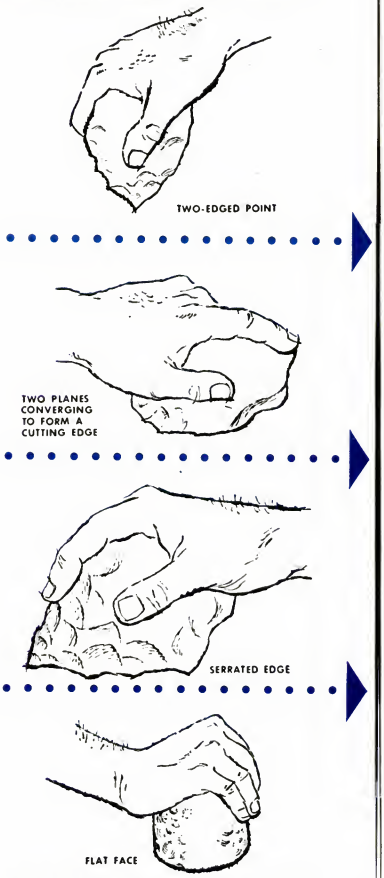
That ancient invention, Wilkie reflected, had become the foundation of nearly everything the human race has achieved. Wilkie himself invented a metal-cutting bandsaw a mere 20 years ago. He is now the biggest manufacturer of bandsaws and saw bands in the world. He heads 47 corporations that make and distribute saws, surface grinders, gauge blocks and other DoALL products, in 46 countries.

Tools Made the Man

A man of wide and intense interests, Wilkie hurls himself into a new hobby as forcefully as he attacks a crisis in one of his factories. Soon after his day on the beach he was buying every new book on anthropology and archaeology that came out. He discovered that some experts attribute the development of the human brain from the ape brain to the constant use and improvement of hand

500,000 Years Ago...

ape men used these tools. Can you guess what each became?



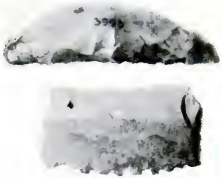
Turn the page to see how they developed into your shop tools.

50,000 Years Ago	5,000 Years Ago	1,000 Years Ago
STONE AGE	BRONZE AGE	IRON AGE

DRILLS

CUTTING TOOLS

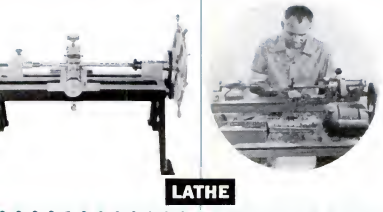
SAWS



BURNISHING TOOLS

100 Years Ago	Today
INDUSTRIAL REVOLUTION	HOME-WORKSHOP AGE

DRILL PRESS



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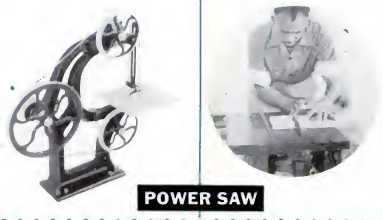
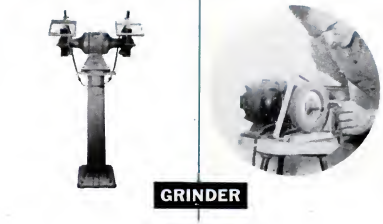


POWER SAW



GRINDER

tools—instead of the other way around.

He began haunting tool collections in museums, and was chagrined to find that nowhere in the world could one see a documented, chronological progression of the tools that have shaped our world, from the Stone Age to the present. Some of the museums had wonderful collections, however, of man's *weapons.*

He Accentuates the Positive

This raised Wilkie's dander. Why should the cunning ways that man has devised to erase himself be emphasized more in museums and written history than the creative devices that have made his lot happier? It was about time, he thought, for humanity to recognize constructive ingenuity as a more potent force than fiendish cleverness. So he built a new kind of museum.

It is portable, in 10 four-by-six-foot display panels, and it tells the story of "Civilization Through Tools" graphically with genuine artifacts, leased on a permanent basis from seven museums. This exhibit is now touring engineering colleges, trade schools, factories and industrial-equipment stores. *The picture history of four familiar workshop tools, at left, is based on the traveling exhibit.*

The panels enable you to trace man's developing tool sense step by step for a million years by walking around a room. Since the exhibits aren't under glass, you can inspect them closely and even touch an authentic "eolith" more than half a million years old, the flint teeth of an 8,000-year-old sickle or a bronze saw in use when the pyramids were built.

Salute to the Past—at $2,000 Each

The earliest machine tools, which brought about the Industrial Revolution, are represented by six working-scale models, made especially for the exhibit at a cost of about $2,000 apiece from research and specifications furnished by the Science Museum of South Kensington, England. Seldom has an inventor taken such pains to salute others who paved the way for him.

Leighton Wilkie can do such things

as establishing a museum because he and his younger brothers, Robert J. and James W. Wilkie, have a $50,000,000-a-year business.

They not only have DoALL plants in Illinois, Minnesota and Canada, but also a national chain-store organization for machine-shop specialties and industrial cutting tools.

Their father had an automobile-repair shop in Winona, Minn., where Leighton started sweeping floors when he was 10 and helping as a mechanic when he was 12. By the time he was 16, the garage had acquired an auto-sales franchise, and the boy was selling cars between high-school classes. Both his car sales and school grades were somewhat curtailed, however, by the palpitating concern that monopolized his attention—the enigma of how to make a million dollars. He'd go to the library and drool as he thumbed through *Who's Who in America.*

FOR HOPS BETWEEN SHOWS, panels tracing the history of tools throughout the ages are shelved like baker's pies in this specially built Dodge truck.

At 18—On the Way to a Million

It was another year before he could afford to shell out $80 for a shabby second-hand Saxon, but at 18 he produced a device to align connecting rods. The garage promptly became a machine shop, and in the next four years turned out 11,000 Wilkie Piston and Connecting Rod Aligning Machines at about $50 apiece. With that start toward his coveted million, Leighton forgot about finishing his engineering and business courses at college, and set up a tool-and-die shop in Minneapolis.

In 1927 he invented a low-cost method of making short-run stampings that he licensed to 800 companies. This made contacts for the Wilkies in the business world that are still fruitful. For example, the Bausch and Lomb Optical Company used the process to tool up for their lightweight Zephyr binoculars. Today the whole Bausch and Lomb industrial line is sold in DoALL stores.

Seeing a need for a better method of cutting out the dies made by his stamping process, Leighton Wilkie then adapted the principle of the lumber-mill bandsaw to a metal-cutting and filing machine. When he told his fiancée he had invented a new kind of bandsaw and was going to market it, she thought her husband-to-be was going to make their living by selling musical saws to hillbilly bands. She married him anyway.

Wilkie's contour saw filled such a crying need in industry that 50,000 of them have been built by DoALL, from sturdy little $450 models to a $125,000 behemoth that handles six-ton dies. The first contour saws, unfortunately, wore out a blade before it had cut through 23 square inches of steel. By 1940, however, the company had developed a carbon-steel blade that would last for 300 square inches, and just last February it announced a new high-speed tool-steel blade that whizzes through 3,000 square inches.

Tolerances and Interchangeable Parts

Besides 50 types of contour and other saws and 300 variations of saw bands for cutting everything from stacks of garment patterns and magazine pages to glass and pork chops, the company makes a line of 12 surface grinders. This activity led to the manufacture of gauge blocks, which provide standards for measuring precision work accurately to millionths of an inch, and enable interchangeable parts to be fabricated in widely separated plants.

Fifteen years ago, Wilkie decided, "I can't run a factory when I'm right on top of it," and forthwith moved to El Paso, Tex., remaining there four years. He followed that with a year in southern New

[*Continued on page 232*]

Car Part Makes Light Meter

His workshop helped James G. Ogden III, University of Tennessee botany student, earn a master's degree. He made a light meter from a car back-up light, a photocell and a neon tube. A count of neon flashes measures solar energy. At his feet is another meter with a built-in counter.

Toy-Train Parts Make a Hand

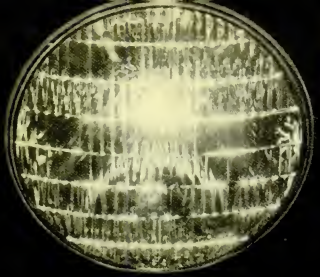
Blowing into the plastic mouthpiece worn on the chest makes this electric hand open and close, so persons with paralyzed hands can grasp pencil, fork or even razor. Charles V. Giaimo (above) of Lionel trains invented it, using toy-train parts. Lionel, 15 E. 26th St., NYC, will manufacture it.

Index Guides Cart to Groceries

The shopper twirling the cylinder on the cart above won't have to hike miles up and down aisles to search out a can of beans. The rotating directory tells just where every item is located in the store. The Brant Co., Marquette Rd., Joliet, Ill., calls it the Supermarket Shopping Guide.

Robert the Robot Walks, Talks

Newest toy for space-happy youngsters is Robert the Robot, a mechanical man who clunks about with lights flashing. He walks, he talks, he raises and lowers his arms and takes an iron grip on whatever is put into his plastic hands. The Ideal Toy Corp., 200 Fifth Ave., NYC, dreamed him up.



New Lights Make Night

THE OLD It looks brighter than it is, because much of the light is spilled upward. Note glaring filament and horizontal reflections off lens prisms.

By Martin Mann

PSM PHOTOS BY W. W. MORRIS

YOU'RE getting new and better headlights for your car. They are brighter, but glare no more. They are far more effective in fog and snow. You'll be able to buy them next month, as replacement units, in all but a few states. By summer they will probably be standard equipment on new cars.

These are the "modified sealed-beam head lamps," first real improvement in auto lights since sealed beams came in 15 years ago. Here's what they have:

• The high beam is brighter by 25 percent. You should get an extra hundred feet or so to pick up a stop sign. The pattern isn't changed much.

• The low beam is brighter, too—up 23 percent, with twice as much light where you need it most, down the right side of the road. You can see the worst hazard—a pedestrian in dark clothes—as much as 80 feet farther ahead. Because the increased light goes to the side and down, there is no increase in glare.

• The new low beam pierces fog almost as well as special fog lamps. It spills very little light upward, cutting out much of the blinding curtain of light that bounces back off fog, rain, snow or dust.

How did they do it? Designing a headlight that is brighter but not glarier sounds like inventing perpetual motion. Actually, the changes are few and rather simple:

• Both beams are brighter because the filaments take more juice—50 watts for high, 40 for low, instead of 45 and 35.

Tests in a cheesecloth fog show how lights work in bad weather

You can make fog in a laboratory, but it gets things awfully wet. So engineers use layers of cheesecloth (near photo at right) as a handy—and dry—substitute to demonstrate the efficiency of headlights in bad weather. How well the new lamps pass the cheesecloth test is graphically revealed in these pictures. The old lamps (center) fail to pick up the car standing behind the cloth fog. The new ones (far right) show it clearly. You can see why: The new lamps throw much less light upward, so less is reflected back into your eyes by particles of fog or rain.

Modified sealed beams for all cars, new and old, put more light on the road, less in the other guy's eyes.

Driving Safer

THE NEW This one is 17 percent brighter, but up-shining light is reduced by hooded filament, tilted reflector, new lens (horizontal reflections are gone).

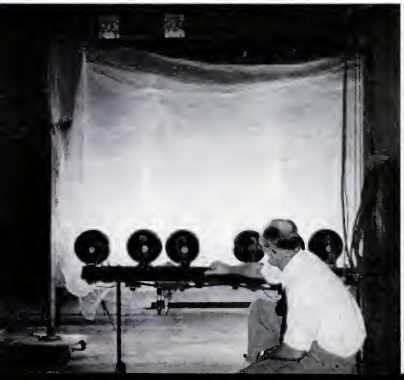
• There is now a little hood over the low-beam filament. This keeps light from shining up to blind you in fog and rain or to blind the other guy as he zooms by.
• The reflector is tilted down, also to cut up-shining light.
• The lens is redesigned, partly to concentrate light on the right side of the road, partly to help stop light from shining up.

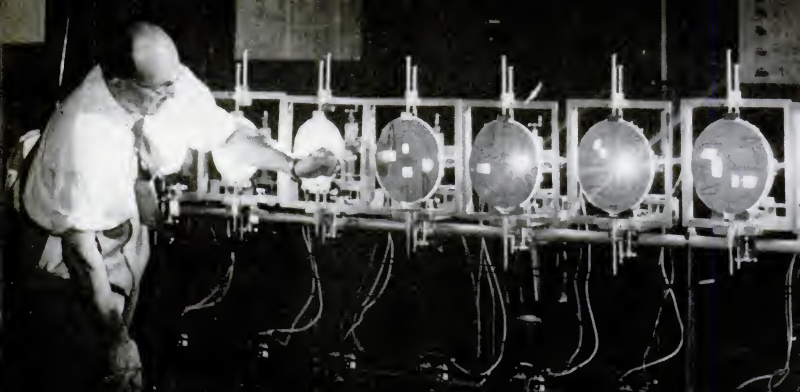
You'll notice the biggest reduction in glare close to the car, where it helps visibility most in bad weather. The engineers can't cut out all the glaring up-light—you need some to read a street sign once in a while. Some up-light is necessary, too, to avoid a distracting sharp cutoff at the top of the beam.

The new lamps make aiming even more important than before. Improperly aimed, their extra light will be wasted—or cause worse glare. (Many cars have badly aimed headlights. As one engineer put it, the average driver can get more benefit from re-aiming his present lights than from slapping in a pair of the new ones without making sure they're aimed correctly.)

Because the new lamps are brighter, driving will call for extra attention to good manners. The high beam will blind you worse than ever when you come up against a jerk who's too lazy to hit the dimmer switch.

Everybody gets in the act. The new headlight is an unusual example of industry-wide cooperation to give the entire public a better product. It will be standard on every car from Henry J to Cadillac. Every lamp manufacturer





BRIDGE OF LIGHTS shows how head-lamp lenses are designed by zones. At left, GE's auto-lighting expert, Val J. Roper, points to a cardboard shield used to develop new lamp. Shields, cut

is making it (and helped to develop it).

The only reason every car can't have the new lights right now is a legal technicality. Auto-light specifications are regulated by state law, and it takes time for state legislatures to change their laws. The few legal okays still needed should come quickly, since it was the state motor-vehicle administrators who made the request for the new head lamps in the first place. Car manufacturers will then make the improved lamps standard equipment. Meanwhile, they will go on sale in January as replacements in every state where the law permits.

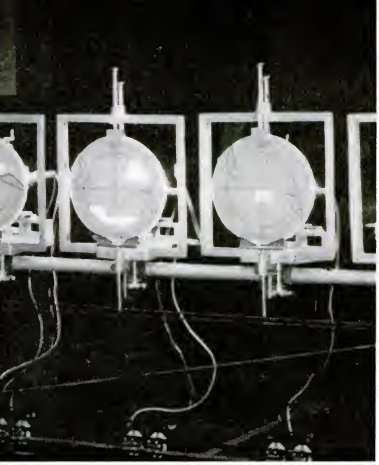
Four-eyed cars coming? Separate lamps for the high and low beams could be the next development in headlights. General Electric and car manufacturers are already testing them, says Val J. Roper, GE automotive-lighting engineer who played a leading part in the perfection of the new standard lamp.

"Separate lights aren't only the engineers' idea," Roper told me recently in his Cleveland laboratory. "The stylists like them, to give car front ends a new look. They would have one advantage: With separate lamps we could design each one to do its own job better. But the aiming problem, always a headache, would become just that much worse. And the state motor-vehicle administrators will object—they want a single standard lamp for simplicity."

How about those wonderful European headlights? Foreign-car aficionados have been raving for years over the excellence of lamps used on the Continent. Much brighter than ours, they claim, yet much less glare.

Comparative tests involving thousands of individual observations were made last summer at the GM proving ground. Detailed results won't be made public for a while, pending a high-level international conference that will try to hash out a uniform headlight standard for the whole world.

This much can be told now, however: The tests showed that the best of the European lamps (and they varied all over the lot) may be fine for European driving but wouldn't be so hot on U.S. 66. Their high beam is twice as bright as ours. This is helpful only on a straight, lightly traveled country road. It is wasted on curving highways, and with any



out to pass light from selected areas, let engineers study effect of changes in those zones.

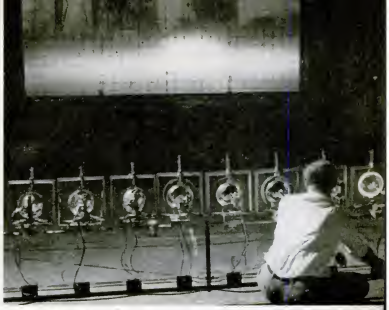
amount of traffic requires dimming at too great a distance. Their low beam, American engineers think, is definitely inferior: practically no light directed up, where some is needed, and too much light thrown to the left, where less is needed.

What ever happened to polarizing? "It's a discouraging story," says GE's Roper. "Polarizing screens over lamps and windshields are the best theoretical answer. They give you just what you want. Your car always has high beams, but opposing cars seem to use parking lights. They let everybody see far ahead, yet they blind nobody, if all cars are properly equipped.

"Unfortunately, I doubt that I'll live long enough to find them on the road. Just too complicated and expensive. The special equipment and the hefty electrical system needed for the brighter lamps would add maybe a hundred dollars to the price of a new car.

"Considering the realities of the automobile business, these new sealed beams we're making do a right good job." END

NEXT MONTH: How to get the most from headlights by aiming them yourself.



NEW LOW BEAM looks like this on the road—plenty of light on the right. Demonstration set-up uses big screen with a projected view of a typical road superimposed over headlight beam.

FOR PRECISE MEASUREMENT, lamp is set on adjustable mount while photocell (out of picture to left) picks up light. Meter tells brightness for each angle lamp is turned to.

YOU CAN SEE THE HOOD (arrow) that shields the new low-beam filament in cutaway sample below. This is GE's version, called All-Weather. Other manufacturers' lamps may differ slightly.

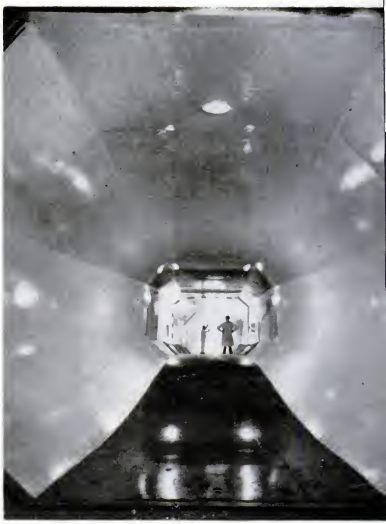
Arresting Gear Turns Field into Flight Deck

ARRESTING gear, used to stop airplanes on Navy carriers, has been installed on the runways of two Midwest airports for emergency use.

Pictured at left is a "barrier" at Fairfax Airport, Kansas City, Kan. Its ends are attached to heavy chains. As a plane strikes the barrier, the chains drag it to a halt. At the Lambert-St. Louis Airport, a cable across the runway is picked up by a tail hook on the plane. Unwinding from a drum, it brings the plane to a halt.

Red Tape Ties Down Helicopter

WHEN John Murray applied to the British authorities to test-fly his homemade helicopter, he got permission to take it 10 feet up—provided it remains tethered to the ground. Murray, a motor mechanic, put three years and about $3,000 into the craft.



Tunnel Tests Six Ways at Once

LOAD, lift, drag, side force, pitch and roll are all checked simultaneously in this wind tunnel, which tests British de Havilland aircraft designs. The breezeway, nine feet high and seven wide, is made for low-speed winds: below 170 m.p.h.

Tractor-Towed Dolly Is 12-by-16-Foot Heliport

THE water-hopping copter above is about to land on a wheeled dolly so it can be towed to its airport hangar for the night. The New York Port Authority has two such float-equipped whirlibirds to ferry personnel between its 10 interstate bridges, tunnels, terminals and airports. The craft land on rooftops, airport strips or water.

Four-Acre Roof Tops Off Giant Hangar

BIGGER than five football gridirons, the largest hangar in the U. S. can shelter five B-52 bombers easily. The entrance, 780 feet long and 65 feet high, is closed by a door that lifts vertically and folds under the cantilever roof. The structure will house Boeing planes between flight tests.

Scientists of 30 nations prepare

A Net to Catch the

NERVOUS NORSEMEN tried to explain the Northern Lights as glints from the Valkyries' golden shields. Today's scientists are closer to the truth but still have many unanswered questions.

Drawing from American Museum of Natural History

Northern Lights

From observation posts stretching nearly from Pole to Pole, experts will soon act in global teamwork to probe auroras.

By Edward and Ruth Brecher

HAVE you ever gazed off toward the north on a clear spring or autumn evening and watched with awe and delight the brilliant display of ghostly, dancing light—sometimes white but often gaily tinted with red, yellow, green, blue or violet—known to the ancients as the Aurora Borealis and to most Americans as the Northern Lights?

Like rainbows and eclipses, these rapidly shifting rays, bands, crowns, curtains, streamers and flames have long puzzled and inspired the imagination of mankind. They are visible about nine clear nights out of 10 in some parts of the far north; 25 nights a year in northern Maine; 10 nights a year along the belt between New York City and Portland, Oregon; and once or twice a year as far south as New Orleans.

Some auroras are visible over hundreds of thousands of square miles. The Great Aurora of February 4, 1872, brightened the heavens all the way from the Rock of Gibraltar to Bombay, India.

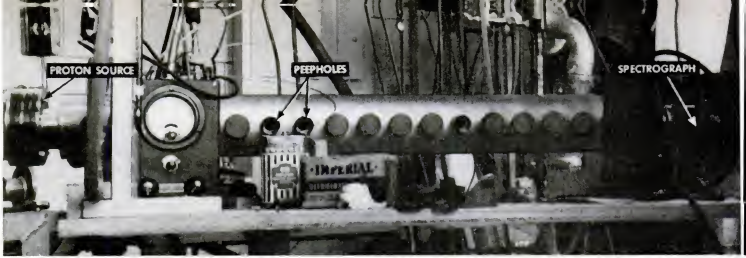
Mythology Gives Way to Science

Mythology explained auroras as the reflections from the golden shields of Valkyries, the blonde warrior maidens who ride through the heavens escorting the souls of dead heroes to Valhalla. Later they were thought to be sunlight reflected from the vast polar ice fields. The newest theories turn out to be even more remarkable than the myth-makers' imaginings.

To confirm and expand the new auroral theories, scientists of more than 30 nations are currently planning a "net to catch the aurora"—a worldwide network of specially equipped auroral observation posts girdling the globe at various latitudes and extending almost from Pole to Pole. Researchers are confident that their network will capture important new facts about the earth, the atmosphere, the sun and the interplanetary spaces. Our Air Force particularly wants to know more, for it has found that the Aurora Borealis is a major stumbling block in preparations for defending the North American continent.

WISCONSIN SKIES glowed with a brilliant display of Aurora Borealis when this picture was made at Yerkes Observatory. The camera was aimed at reflections in a round, convex mirror.

Scientists made important progress in understanding the aurora during the "First International Polar Year," back in 1882-83, when many nations sent expeditions into the Arctic. The facts collected by the numerous International Polar Year expeditions were pooled and studied, and scientists were able to report with assurance that auroras are not optical illusions but actual lights shining in the



AN IMITATION AURORA was created in this air-tight tube by Univ. of Chicago's Dr. A. B. Meinel. He pumped out most of the air to match upper atmosphere and then shot protons into it.

atmosphere from 60 to 600 miles above the surface of the earth. Auroras do not occur most frequently in the vicinity of the North Pole, they declared, but in a 300-mile-wide belt or zone which encircles the earth far south of the Pole. This "auroral zone" cuts across northern Alaska, then swings far south over the middle of Hudson's Bay, in Canada. Then it passes south of Greenland, over Iceland, just north of Tromsö in Norway, and on over the Arctic Ocean north of the Eurasian continent.

Auroras Are Studied at Thule Air Base

The center point which the auroral zone encircles is neither the North Pole nor the North Magnetic Pole toward which the compass points, but rather a spot in western Greenland, known as the "North Geomagnetic Pole." The American air base at Thule, Greenland, is close to this point and therefore a strategic center for auroral studies. A similar point in the Antarctic, the South Geomagnetic Pole, is also encircled by an auroral zone —the scene of the less-known Aurora Australis, or Southern Lights.

Nineteenth-century observers also made another discovery. Night after night and year after year they scanned the skies and recorded the auroras they saw. Simultaneously daytime observers were watching the sun through special filters and recording "sunspots"—great cyclonic storms stirred up on the white-hot face of the sun. The two sets of records showed that both sunspots and Temperate Zone auroras are much more frequent in some years than in others. The number of sunspots reaches a maximum every 11 years—in the years preceding the maximum frequency of auroras. (The next peak is predicted for 1957-58.)

Excited, the scientists then turned their attention to solar "flares." These are tremendous volcano-like eruptions of white-hot gases which rise like geysers near active sunspots and shoot hundreds of thousands of miles into space. By careful study of solar flares and auroras, the scientists found that major auroras follow flares after an interval of at least 20 hours, and sometimes longer than that.

This time lapse proved that it could not be *light* from the sun that causes auroras: light, traveling 186,000 miles per second, takes only eight minutes to travel from sun to earth, not 20 hours. Something in addition to light must therefore be reaching us from the sun—something which takes more than 20 hours to get here and which must accordingly be dawdling along at the comparatively slow speed of 1,000 miles per second or less. What is it?

Radio added the next significant facts. By the Second International Polar Year, 1932-33, air travel had opened up both the Arctic and Antarctic to scientific

EXCLUSIVE COLOR PICTURES of how scientists launch rocket balloons, such as those that will be used to study the Northern Lights, are on pages 114-115.

expeditions. The Poles themselves were accessible. Radio made it possible for scientific outposts thousands of miles apart to study the same aurora from various angles simultaneously, and to exchange information about it from moment to moment—provided the radio waves didn't "black out."

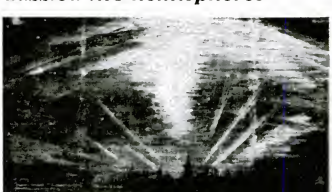
Often short-wave radio circuits did fail, in both the Arctic and the Antarctic—and scientists noted with interest that the very hours during which auroras shone most brightly were the hours when short-wave radio was least reliable. It was during these periods, too, that magnetic compasses went haywire, and sometimes so much static electricity was built up in long-distance telegraph and telephone lines back home that communications were impeded.

Short Waves Bounce Back from Lights

In the 1930's, radio amateurs, or "hams," added the next significant fact to the growing body of auroral science. They experimented with very short radio waves—waves almost as short as those now used for television. Venturesome hams discovered that on certain nights they could get better results, no matter where they wanted to send their signals, if they aimed their antennas toward the north. The nights on which this northward maneuver was most successful were the nights on which auroras were shining most brightly. The radio waves were literally bouncing back off the aurora.

It is this tendency of short waves to bounce back from auroras that today has the U.S. and Canadian air forces worried. They are planning a plane-tight ring of radar stations around North America, to provide advance warnings of the approach of a plane from any direction. Radar sets aimed out over the Atlantic and Pacific work very well, but in the north radar waves may bounce back from the Aurora Borealis and show a confusion of signals on the radarscopes. Incoming planes from the Arctic can therefore penetrate far into central Canada, under certain circumstances, without being picked up on a radar screen. New

This spectacular performance dazzled two hemispheres



OVER NEW YORK, as an artist for *Leslie's Popular Magazine* recorded it, the historic aurora of Aug. 28, 1859, visible throughout the U.S. and even in Havana, Cuba, looked like this.

OVER MELBOURNE, Australia, on Sept. 2, 1859, four nights after the auroral show in the Northern Hemisphere, the Southern Lights performed in a manner both different and better.

types of radar may have solved this problem, for in September the Air Force announced plans for a new joint U.S.-Canadian radar net which will stretch across the continent far to the north of the auroral zone. Plane-to-ground and ground-to-ground communications are also impaired by auroras in northern Canada, and are likely to be even more seriously disrupted during the next auroral peak. In an effort to overcome these obstacles, both U.S. and Canadian defense agencies have been sponsoring auroral research.

Meanwhile, the newer auroral observations have made possible a more complete theory of how auroras are produced. Among the most important contributions have been those made by Prof.

[*Continued on page 238*]

Lubricant Sprays Away Squeaks

A PUSH-BUTTON bomb of powdered graphite has joined the oilcan and the grease gun at auto-supply stores. The workman above is spraying the dry lubricant on car springs. The DuPont photo shows a bomb made by Miracle Power Div., 1801 Spielbush St., Toledo, one of several companies making similar products.

Tube Holds Radar Pictures

WITH this viewing tube, a radar operator in a plane or on a ship doesn't have to peer under a dim hooded screen to watch fleeting images. He can view radar displays in bright sunshine and even hold, or "store," a visible image for several minutes before erasing it. The tube was developed by RCA for the Signal Corps.

Toy Cleaner Really Cleans

MOTHER's little helper knows she's helping with this toy vacuum cleaner. She can see the dust sucked up by the nozzle swirl through the plastic hose to the aluminum tank. With a shorter hose, the tiny vacuum is said to do a real job on car or furniture upholstery. Gay Toys, Inc., 6432 Cass Ave., Detroit, makes the Pla-Vac.

Gambling Machines Put to Work

NINETY-TWO gambling machines are going to work in a plane factory—but not to put the bite on pay envelopes. Knocked down by workmen (above), the electronic parts will be used by engineers to further B-47 production. Boeing paid $15 apiece for the confiscated pinball machines, expects to get $100 worth of parts from each.

. . . That's one of 20 questions answered by a report on what the Army has learned about . . .

How to Keep Warm

By Ronald M. Deutsch

GREATCOATS and mufflers, galoshes and vitamin pills are coming to light again as Americans gird for their annual struggle with Old Man Winter. Will they help? Unfortunately, many of the most cherished beliefs about winter have no basis in fact!

This has been shown by 10 years of intensive Army research. While most of us have been heading for our firesides, a hardy crew of scientists has been exploring the frozen north. They are the men of the Army's Environmental Protection Division. From their work on the icy shores of Hudson Bay, on the bleak slopes of a New Hampshire mountain, and in laboratory cold chambers, have come findings that may keep you warmer and healthier this winter.

Here are some tips for you, based on what is probably the biggest series of weather experiments ever attempted:

Q ***Will "quick-energy" foods keep you warmer?***

A This is commonly believed, but Army studies show that if you eat regularly, there are no such things as "quick-energy" foods. Eating almost anything, however, will make you a little warmer, because the assimilation of food creates some body heat.

Q *Will hot drinks and heavy foods help?*

A Hot foods and drinks may make you feel momentarily warmer, but they are of little value in the long run. You need food high in protein and calories to keep you warm. An ice-cream cone can help more than a cup of hot coffee.

Q *Should you avoid "light" foods, such as salads?*

A No, they have food values that you need all year round. Basically, there is no reason to change your diet in winter.

Q *Will liquor ease the cold?*

A Definitely not. Alcohol makes more blood flow to your skin, carrying inner body heat with it. This makes you feel warmer, but you lose heat to the air. Even a small amount of alcohol will make you colder.

Q *Should you take more vitamins in winter?*

A Many people think you should, but Army scientists do not agree. If you are eating a balanced diet and have no vitamin deficiency, you probably need no extra vitamins.

The one exception to the rule is Vitamin D, which you get partly through sunlight. In winter you get less sun. But it is always a good idea to consult your doctor before taking vitamins.

Q *Do people gain weight in winter?*

A Contrary to popular belief, the Army finds that the body changes little in the cold. But increased appetite on frosty days, coupled with inactivity, may fool you into taking on more food than you need, thus adding an extra inch to your waistline.

Q *Are you more likely to catch cold?*

A Army quartermaster researchers maintain that low temperatures have little to do with the common cold, except indirectly. Bad weather keeps you indoors more, in closer contact with others, where ventilation is poor. So it's easier to catch a virus from someone else. Stay out of crowded, badly ventilated rooms if you want to avoid colds.

Unless the cold weather is extreme, it isn't dangerous or even unhealthful. Army doctors believe chill is a minor cause of respiratory illness.

Q *Is exercise tougher in the cold?*

A Exercise is actually easier in winter than in summer because more blood goes to your muscles, although bulky clothing and poor footing make some work more strenuous. Snow-shoveling

can be very fatiguing, comparable in energy cost to mountain climbing. If your heart is too weak to permit you to climb a mountain, don't attempt to shovel snow.

But remember that exercise is one of your best means of creating body heat. Don't stand still in the cold.

Q ***Are wet feet dangerous?***

A No, if they are warm. But with most footwear, moisture on your feet evaporates rapidly, resulting in extreme cold.

The Army's Quartermaster Corps has made extensive studies of the wet-foot conditions that lead to frostbite and trench foot. The severe cold, they found, is the problem—not the wet. So they developed the new "Thermos Bottle" boot, in which the feet perspire freely, but the perspiration cannot evaporate.

When you're going to be out in the cold, you can easily reproduce the Army boot. Line a heavy sock with plastic, of the kind used to wrap frozen foods. Then wrap another layer of plastic outside the sock. Your feet will perspire, but you won't be chilled.

Q ***Is fit important in winter clothing?***

A Yes. Good winter garments should fit well, but somewhat loosely. Loose clothing flaps enough when you are exercising to set up tiny air currents that carry off excess heat. This keeps you from sweating and then later chilling. And when you stop working, the loose clothing traps layers of "dead" air around your body to seal in warmth.

Especially in winter work or sports it is good to remember that even a tight belt can block air circulation. For skiing or skating, buy clothes with drawstrings at wrists and ankles. You can loosen the strings while you're exercising, then tighten them when you stop.

Q ***Is cotton just as warm as wool?***

A Yes. it is. But the cotton must be as thick as the wool. Army studies show that *thickness* is what makes the difference. Cotton, nylon and rayon can make good winter clothing. Fuzzy materials, such as fur or rough wool, have the added advantage of picking up more of the sun's heat.

Q ***Is it wise to dress in heavy clothing?***

A Not always. Strangely enough, your biggest danger in the cold is probably overheating. The perspiration you produce evaporates to make you cold. You can get thoroughly chilled while very heavily dressed.

Remember when you dress for winter that clothes can't make you warm. They can only keep body heat in and cold air out. Several thin layers of clothing are better than one thick one.

Q ***Should you go out without a hat?***

A Hats are not as important as gloves, but they make a difference. The Army reports that the main advantage of a hat is that it can be taken off easily when you start to overheat. Similar studies show that a scarf's biggest job is *not* to protect your neck. Actually it serves best to seal in heat from your back and chest. When you tie your scarf, make sure to fit it carefully underneath your coat collar, leaving no gaps for the warmth to escape.

Q ***Can women take the cold better than men?***

A Yes. Women have some 75 percent more body fat than men on the average. This holds in considerable body heat. But while women and stout men are actually warmer, they *feel* colder, because the extra layer of fat keeps their inner heat from warming their skins.

Unfortunately, however, women's clothing styles lose them their natural advantage. Stockinged legs, representing 35 percent of a woman's skin surface, cause her to lose heat rapidly. Army scientists shrug their shoulders at this problem. But they do recommend—wherever fashion permits—that women wear slacks or ski clothes.

Q ***How helpful is long underwear?***

A Quartermaster researchers praise long underwear as being the boon that grandma always said it was, since it gives protection to most of the body. When taste and style allow, they suggest, women and men alike could profit from cotton underwear worn to the knee.

Q ***Can dirty clothes keep you cold?***

A Yes. Textile engineers have found that dirt mats cloth fibers and even breaks them, thus destroying the insulating value of clothing. Your overcoat will come back from a dry cleaning a much warmer garment.

Even more important than clean clothes are dry ones. Moisture in clothing evaporates, taking body heat with it. Also, wet clothing is a poor insulator.

Q ***How much help are gloves?***

A Probably more than you think. Your hands make up six percent of your entire body surface. Protect them with gloves and you'll stay warmer.

Q ***How weak is winter sun?***

A It is often just as potent as summer sunlight, the Arctic investigators report. Staying in the sun when you're out of doors can keep you several degrees warmer, a good thing to remember when you're watching late-season football games.

But keep out of the wind. Army volunteers exposed to the wind could not take nearly as much temperature drop as those protected from it. In the open, a windproof garment of light, tightly woven cotton will keep you warmer.

Q ***Will your body protect itself from the cold?***

A To a certain extent it will. But it is just this automatic protection that causes most of our unpleasant winter sensations. When your skin loses too much heat, a nervous reflex makes your muscles work spasmodically to produce body heat. This is, of course, shivering.

As the air gets frigid, your blood will leave your skin to protect your vital organs. Since your skin contains most of the nerves that feel coldness, you'll feel even colder. It is this that creates the sensation of numbness and makes people look "blue with cold."

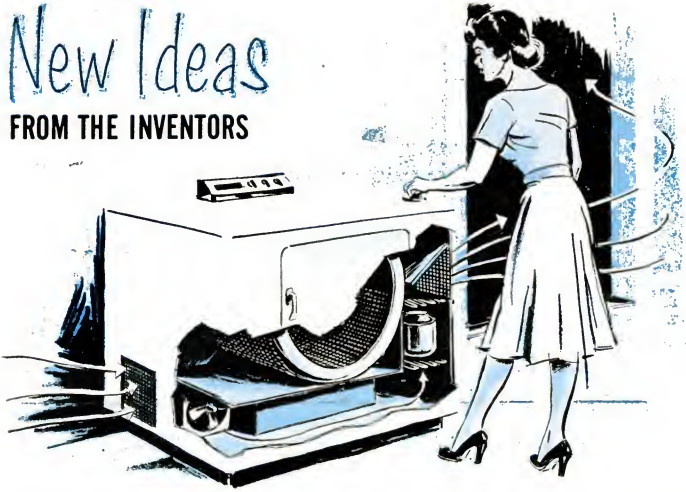
A third natural response to cold is a tendency to hunch up. You bend over a little, pull your shoulders together and keep your arms close to your sides. This is simply your body's way of reducing the surface exposed to the air and slowing down its rate of heat loss.

Q ***Can you fall asleep in the cold and never wake up?***

A Despite all the folklore on the subject, it isn't at all likely. If it did happen, the cause would be severe exhaustion and lack of food—not the cold. END

New Ideas

FROM THE INVENTORS



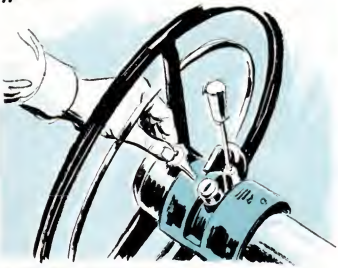
1 Clothes Dryer to Freshen Air. This GM-patented appliance would dry your laundry—or your laundry room. A conventional rotating drum would spin moisture out of wet clothing. Fans inside the sealed cabinet would force damp air past a refrigerator-type evaporator coil, where water would condense and drain off. With drum disengaged, the device would circulate room air through the dehumidifying system.

2 Night Light to Double as Flash. This flashlight could burn all night, every night, without draining its batteries. When plugged into its base, it would work off house current through a step-down transformer. But when you needed a portable lamp, you'd just lift it off its stand and use it like any battery-powered flashlight.

3 Sack to Clean Paintbrushes. A solvent-filled plastic bag would make paintbrush cleaning a clean-hands job. This inventor says that kneading the bristles and squeezing thinner between and around them gets a dirty brush clean in about 60 seconds. It would also take less solvent to clean brushes—and rollers—by this method.

Please turn the page for more new ideas

MORE New Ideas from the Inventors



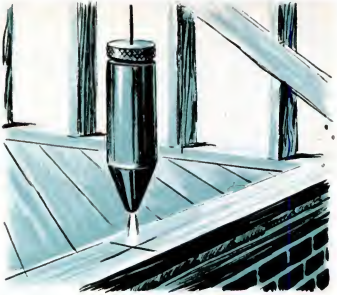
4 Shift Lock to Guard Car. A thief could short the ignition switch, but if your car were protected by this attachment he might have to make his getaway backwards. A collar that could be riveted or welded on any steering column would engage a detachable key-lock. When the lock was in place, the gearshift or automatic-transmission lever would be immobilized.

5 Trash Can to Roll Easily. It would take less effort to move heavy trash or ashes in a can that had this roller base. Ball-bearing races would be enclosed between the can bottom and a flat footplate, so there'd be no danger of the can "creeping" or drifting down a slope. When you tilted the can, however, the free-wheeling assembly would let you roll it easily along.

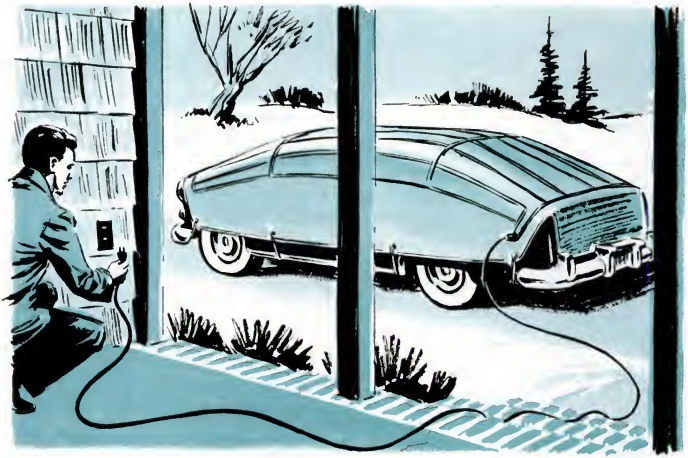
6 Juke Box to Sell Records. If you happened to like a record you heard on this juke box, you could deposit some extra coins and take a fresh copy out of the slot. The amount you paid for playing the tune would be credited to the purchase price. Music stores might use the demonstration machine to speed and simplify sales.

U. S. patents on these inventions have been granted to: 1. R. K. Sheumon, Dayton, Ohio; 2. B. L. Levinson, NYC, and J. Korshin, Cedarhurst, N. Y.; 3. H. W. Battle, Louisville, Ky.; 4. W. B. Hildebrand, Kansas City, Mo.; 5. P. Leystra, Fair Lawn,

7 Tank to Feed Steam Iron. This iron wouldn't run dry in a hurry, but neither would it be weighted down by its water supply. A separate tank clamped to the ironing board would hold—and heat—an ample quantity of water. Rising steam would travel through a flexible connecting tube to the iron, where it would be reheated and dispersed through plate holes.



8 Plumb Bob to Light Up. By pinpointing a beam of light exactly on center, this bob would help a workman sight a plumbed line faster and mark it more accurately. The illuminated plumb bob would resemble a pocket flashlight, but would be precision-made for exact alignment and weight distribution. A lens and a focusing aperture would direct the beam.



9 Cover to Shield and Warm Car. An electric auto blanket designed as a portable garage would protect a car's body from winter weather, keep the engine from freezing, and save you the discomfort of starting up a four-wheeled icebox on a cold morning. The cover would unwind from a spring roller clipped into bumper brackets.

N. J.; 6. L. J. Andres, Chicago; 7. L. Reichold, Simsbury, Conn.; 8. E. C. Mitchell, San Diego, Calif.; 9. E. J. Poirier, Alhambra, Calif.

New Look for Churches: Modern Design Takes Over

Master architects apply their skill to houses of worship with striking and beautiful results.

ONE out of every four churches being built in the U.S. today doesn't look the least bit like a church. It has a strange, new architectural beauty and an undeniably inspirational look, but the traditional slender white spires and Gothic arches have disappeared. In their places rise sharply angled or sweepingly curved modernistic structures of concrete, glass and steel.

Four outstanding examples from the Midwest are shown here, but the new look in churches can be seen in all parts of the land. Architecturally conservative New England will soon shake off orthodoxy with a cylindrical chapel.

ONE GREAT, SOARING CURVE roofs the sanctuary (above left) of a synagogue designed for Congregation B'nai Amoona, St. Louis, by the late Eric Mendelsohn. A sweep of recessed windows (above right) floods the ark, focus of the devotional service, with afternoon light. **Huge curved steel beams support the church.**

AN INVITATION to prayer, the completely open front of the chapel at left faces the campus of Illinois Institute of Technology in Chicago. Architect Mies van der Rohe used an extremely simple design and common materials—the roof is made of prefabricated concrete panels—to achieve inspiring beauty for his building on a limited budget.

STAINED-GLASS WINDOW—twentieth-century-style—dominates St. Ann's Catholic church, designed by Joseph D. Murphy, in Normandy, Mo. The window, by Emil Frei and Robert Harmon, actually contains many opaque "panes" of painted wood, so that changes in lighting alter the pictures. At left below, the outside.

THE MOST CONTROVERSIAL architect of our time, and possibly the greatest, Frank Lloyd Wright, created the meeting house (right) of the First Unitarian Society of Madison, Wis., his family church. Its magnificent, complexly angled prow of glass, stone and copper surrounds the altar, seen in the bottom photo.

1 FOLDED BALLOON is unpacked. The 110-foot-long ribbon of plastic is laid out on the deck of the U.S. Navy icebreaker *Atka.*

2 HELIUM IS VALVED IN through a narrow red inflation tube. The balloon's plastic head fills out and rises slowly from the deck.

These Balloons Launch Rockets

ATOMIC particles that hurtle into our atmosphere may help scientists learn more about nuclear energy. What they learn may affect space travel, war and countless other things.

One way to study them is to send instruments into the no-man's area almost 70 miles above us in rockets launched from balloons. These striking photos show how that neat trick is done.

3 STRAINING BALLOON gulps the last of 34 tanks of helium. Project Skyhook is sponsored jointly by the Office of Naval Research and the U.S. Atomic Energy Commission.

4 INFLATION is nearly completed. When the balloon reaches its 70,000-foot rocket-firing altitude, it will be 68 feet in diameter.

5 LIFTING POWER of the balloon is tested. It has to raise weight bags that are 50 pounds heavier than the 220-pound Deacon rocket.

6 ROCKET IS HOOKED onto the balloon at the end of a 100-foot nylon line. Scientists give it a helping heave over the side.

7 ROCKOON COMBINATION climbs skyward at about 1,000 feet a minute. Rocket mechanism will kick missile, packed with instruments, 350,000 feet into ionosphere. A tiny radio transmitter sends scientific data back to the ship.

HERE COME THE '55 CARS

CHRYSLER Long, sleek lines have been borrowed in part from the company's "idea" cars. It is two inches lower than last year's models. For more details see page 135.

BUICK Outside changes include new grille and tail lights. Under the hood: more power and a "variable-pitch" transmission for faster passing. For the full story see page 129.

The Ford-Plymouth-Chevrolet Story

Playing for keeps, the Big Three go after your trade with such lures as hot performance, luxury and a low, low look.

By Frank Rowsome Jr.

AUTOMOBILES, like women, are acquired for a variety of motives, such as beauty, utility, reasonable maintenance, lively response, and special features. Arming for 1955's crucial Big Three market, each maker has spent many millions in shaping a vehicle that combines the strongest lures. So it isn't surprising that the new Ford, Plymouth and Chevrolet have a lot in common—as well as some fascinating differences. The parallels first:

• Each has a whopping overhead-valve V-8 that delivers more power than most Packards, Cadillacs or Lincolns just a few years back. Each also offers optional extra-power combinations that boost output to still loftier levels around 180 hp. (To sales departments, there's only one answer to the headachy question of how much power is enough: At least as much as the competition has.) To copper the bet, each maker also offers faithful sixes of relatively modest power—down around what you got in the heavy quality cars of 1946.

• Each has pulled out all stops in prettying up its cars—wrapped windshields, hooded headlights, multihued paint jobs, jewel-styled hardware, drawing-room upholstery. "We're building boudoirs on wheels," comments a ranking engineer morosely. "On some jobs, the trim costs more than the engine."

• Each has been redesigned to be a little lower, and to look a lot lower. Lowness and length are believed to bring out the

FORD **This fancy, four-eyed beast is a direct descendant of the flivver.**

PLYMOUTH **Do you think old maids will keep buying them?**

CHEVROLET **Touches are lifted from Cad, Olds, even Ferrari.**

FORD The top of the line, and slinkiest, is the Fairlane Crown Victoria below. A shiny metal strip bisects the top; you can get the front half in green plastic. At right is the middle-line two-door.

checkbook, according to Detroit thinkers who cite the sales troubles of parkable and garage-fitting, but dowdy, cars.

• Each would love to sell you the works in the gadget department: power-assisted brakes and steering, no-shift or overdrive transmissions, push-button windows and front seats, and windshield squirters. Plymouth and Chevrolet have air conditioning, and Ford doubtless will by warm weather. Each provides tubeless tires as regular equipment, though Plymouth tags them as "optional at no extra cost."

• Each uses, underneath the sheet metal, basically similar suspensions and drives —coil springs in front, leaf springs in back, and Hotchkiss drive. (All three have had to cope with the problem of rear-spring distortion under the torque of the muscular new engines.) Each has modified its chassis and shaved a bit off minimum ground clearance. Each uses suspended brake and clutch pedals.

The differences. These seem more meaningful, if only because they relieve a person from thinking it is an eeny-meeny choice. (Some of the following specs may yet change; they were pried out nine weeks before Ford's and Plymouth's announcements, in a year when each decimal place is competitive.)

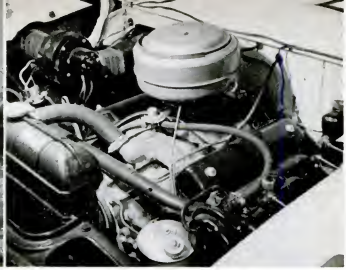
Ford engines. The V-8 is essentially similar to '54's—with the major difference that it has grown 33 cubic inches to a big 272. (The bore is up from 3.5 to 3.62 inches, and the stroke from 3.1 to 3.3) This boost costs almost no weight penalty: the block runs within half a pound of last year's.

Compression has been raised to 7.6:1, although the engine runs on the same regular fuel that the 1954 job did at 7.2, thanks to some "mechanical octanes"—touch-up improvements in combustion-chamber shape, better valve cooling and new antifouling spark plugs. There is also a new camshaft, calculated to improve low- and medium-speed torque, which pulls 2½ inches more vacuum at idle than its predecessor.

The six-cylinder engine has chiefly touch-up changes, notably a boost to 7.5 compression.

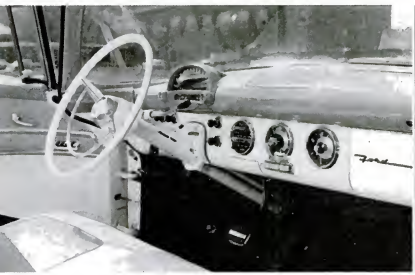
For the customer who wants power to burn, Ford provides an optional "power package" consisting of a four-barrel carburetor in place of the regular two-barrel one, with intake manifold to match; a modified distributor and special radiator; and special 8.5:1 cylinder heads, which of course call for premium fuel. This rig is available only on automatic-transmission

BORROWED FROM THUNDERBIRD are many styling touches, including rear-quarter and tail-light shapes. A pair of back-up lights can go over red lenses. Twin tailpipes end under the bumper.



THE INCHES don't show at a glance, but this Ford has bigger displacement than '54 Mercury, Buick Special or Chrysler Windsor. In hopped-up car, air cleaner resembles that on page 127.

CIRCLES are new dash theme: from left, they are ventilating system, radio and clock. Range indicator for automatic gearbox lights up and is built into panel just over steering column.



ONCE YOU GET IN, which takes some bending, the hardtop is luxurious. Textured plastic upholstery, foam rubber, and gee-whiz color combinations have all got their hooks out for you.

cars in the Fairlane series, which displaces the Crestline. Dual exhausts are standard on this line, whether or not you buy the package. Ford is staying with solid valve lifters and, except for the hopped-up cars, manual chokes.

Reported powers are 120 hp. for the six, 162 hp. for the V-8 and 182 for the goosed-up version.

Plymouth engines. Here the setup is a bit different. At the bottom of the heap is the familiar L-head six, moderately vitamin-fed for 1955. Its compression is raised a hair to 7.4; the already-long stroke is stretched out a quarter-inch to 4.63; and the displacement and power go up to 230 cubic inches and 117 hp.

The V-8 engines come in two displacements (241 and 259 cubic inches) and, by dint of an optional four-barrel carb on the larger one, three horsepowers: 157, 167, and 177. Plymouth's guiding notion here is to provide something for everyone, like shoe or hat sizes. Compression ratio is 7.6:1.

Though the engines show kinship to the Dodge V-8, there are interesting differences. They're going to call the combustion chamber a "polysphere," because the exhaust-valve seat is located in a "polygonal section of a spherical surface." (Try visualizing that the next time you have insomnia.) The valves are paired side by side, transverse to the engine, unlike Ford and Chevvy, where they run fore-and-aft. Unlike past Chrysler-built engines, valves are worked off a single rocker shaft, which saves weight (and

PLYMOUTH The hardtop below and convertible at right are both Belvederes, showpieces of the wholly restyled new line-up. Headlights and grille may suggest Merc, tail lights new Buick.

cost). This also permits a smaller cylinder-head cover that doesn't mask the plugs. These stick out *above* the exhaust manifold, giving an accessibility that will please Saturday-morning mechanics. The engines have automatic chokes and, except on the six, hydraulic lifters.

Chevrolet engines. A customer can get six different power packages for '55, but they boil down to two blocks with varying combinations of cam, carb, gearbox and rear axle.

Like last year's, the sixes are 235-inch OHV jobs, running at 7.5:1 compression. They differ from each other chiefly in the camshaft. This year, Chevrolet's dynamometers rate them at 123 and 136 horsepower. The lower rating goes with three-speed or overdrive boxes, the latter with automatic. To fit the lowered hood line, both sixes have a redesigned air cleaner and a relocated, slower fan.

The basic V-8 is wholly new. It is also short, light and sassy. The block itself is not quite 22 inches long, and the complete engine weighs about 30 pounds *less* than the less-powerful six. It has a 265-inch displacement, 8:1 compression, and a rating of 162 horsepower at 4,400 revs. The bore is a husky 3.75 inches, the stroke a shortest-yet three inches.

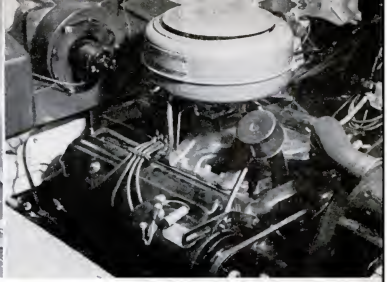
Chevvy's valve train is interesting. As in the new Pontiac, there are no rocker shafts at all. Each push rod and its accompanying valve stem nose against a little steel clamshell. This pivots on a central stud, acting as a combined rocker arm and shaft. According to Chevrolet people, the arrangement works durably and well. They've run test engines for hours at a screaming 5,200-r.p.m. overspeed without valve float.

For all-get-out characters, Chevvy's hottest package combines a four-barrel carburetor and dual exhausts. Available with any transmission, this job is rated at 180 horsepower at 4,600 r.p.m.

Dimensions. With substantial body and chassis changes for Ford, and drastic ones for Plymouth and Chevrolet, almost all major measurements are different this year:

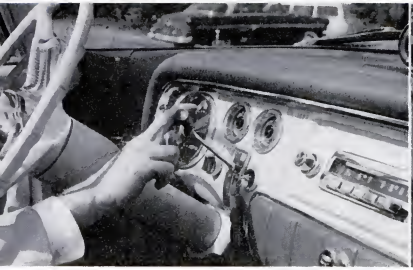
	Ford	*Plymouth*	*Chevrolet*
Wheelbase	115.5	115	115
Over-all Length	198.5	203.8	195.6
Loaded Height			
Sedan	61	60.1	60.5
Hardtop	59	59.3	59.1

LOW ENOUGH to be tripped over in the dark, Plymouth has enough clearance for normal going. Gas filler is in right fender, so its pipe uses space behind spare that is usually wasted.



NEW V-8 has good accessibility, with plugs above exhaust and no ventilating ducts by fenders. Idling engine still lolls languorously on its rubber mounts the way the old one did.

NONREFLECTING TEXTURE is sprayed on shrouding over instruments. Dash selector is gated for no-looky operation. Chrysler's new coaxial power-steering system is a Plymouth option.



PLENTY OF SPACE, for odd shapes, is available in the trunk. Part of the 33.8 cubic feet is in a valley ahead of the axle hump. It may collect odds and ends like the folds of a sofa.

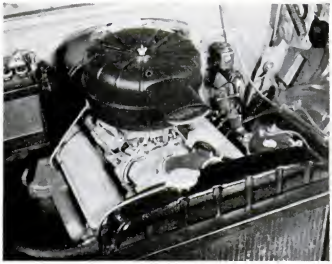
	Ford	*Plymouth*	*Chevrolet*
Ground Clearance	6.6	5.6	6.5
Front Headroom in Sedan	35.1	34.9	35.7

Bottoming on a rutted back road is going to come easier in the future. since ground clearances have all been pared. (The figures above are for hardtops; sedans and wagons will have up to an inch more.) Tightest of all is apparently the Plymouth convertible, where with five passengers aboard, a frame X member comes 4.4 inches above the ground.

When the cars *do* run aground, Ford looks to be best off—the frame side rails are low points. The company had a special engineering program smoothing off protuberances and tucking up vulnerable bits. On Chevrolet a section of the exhaust pipe is lowest, but just above that, as with Plymouth, the vulnerable oil pan might catch the blows. Automatic-transmission Chevvies also have two oil lines running to and from the heat exchanger that look to be fairly snaggable.

Compared to '54, Plymouth has of course changed most drastically. It has gone from a stubby vehicle in which you could wear an Abe Lincoln hat to the longest, and, in respect to headroom, the lowest of the three. Its over-all length is up by a fat 10.3 inches. Of this stretch-out, the biggest single growth (5.5 inches) occurs in the rear overhang. Surprisingly, while maximum width has increased less

CHEVROLET At first glance, Chev seems to have been sired by Cadillac and foaled by Olds, with Buick as kissing cousin. But the insigne is like that on millions of Old Reliables.



SNOUT on front of air cleaner marks hopped-up car with four-barrel carb, dual exhausts, 180 horsepower. This is a test prototype; production cleaners may have fancy paint job.

than a third of an inch, hip room has grown by over three inches in front and still more in the rear.

Putting away the tape measure, the writer has tried on the new sedans and hardtops for size, which is 5 feet 11½ inches. There weren't noticeable differences among makes. Front and rear sedan seats are amply wide, and have adequate headroom. As in the past, there isn't *quite* enough leg room for a tall driver, even with the seat full back. (You can get plenty of room by having the seat mounting relocated backward, though this crowds rear-seat riders.)

The hardtops are something else again. Getting behind the wheel involves the cautious navigation of your kneecaps past the lower corner of the wrapped windshield, and the simultaneous neck-bending needed to get your head in, too. (This isn't a major gymnastic by any means, though if you blunder into the car sleepily, a series of stunning blows will wake you up.) Once in, the roof is noticeably close, though not oppressive until you try to stick your head out of the window—for example, on backing up. This is tricky and can raise bumps.

All three makers, well aware that hardtops are growing marginal, operate on the theory that most hardtop customers will willingly trade hat space for a sporty silhouette. It seems an acceptable notion; but if your personal dimensions are on the long side, or if you will have elderly and nonpliable passengers, it would be wise to have some trial fittings first.

Running gear and chassis. Ford has boosted brake-drum diameter on all wheels from 10 to 11 inches, which promises a substantial gain in both performance and lining life. The frame has a new swept-down shape out in back, behind the "kick-up" that clears the axle. As in the Thunderbird, rubber bumpers protruding from the frame tame the pretzeling tendency of the rear springs under heavy torque. Up front, the entire ball-

[*Continued on page 248*]

Little Rambler Loses Its Pants

A LOT of motorists will give the 1955 Rambler a double-take in the next few months—those front wheels no longer wear pants. They're exposed. The beaded cutout gives the car a shorter turning radius. Under the banner of the newly formed American Motors, combining Nash and Hudson, the Rambler will no longer be exclusively Nash. When Hudson dealers sell the car, it will be the Hudson Rambler.

Lead weights lower cars

THIS is the season when heavy lead weights and spring clamps are at a premium in Detroit. The reason is that automobiles must be sprung to accommodate a full load of passengers and luggage. Unloaded, they sit high on their running gear. Manufacturers' photographers use the weights and clamps to bring down the bodies and give the cars that long, low look.

New grille is second choice

ONE new car has a grille that was never intended for it a couple of years ago. Its manufacturer brought out a dream car with a handsome grille on it. The styling department looked and said Dandy!—that would be the grille for 1955. A competitor looked, too—and copied it for 1954.

V-8s beating out sixes

IN THE 1955 crop of cars, only nine retain six-cylinder engines. Sixteen will feature V-8s. Eleven of the 16 have been introduced since the model year of 1952. Four cars offer a choice between sixes and V-8s.

Gas keeps pace

AUTOMOBILE gasolines—in premium grades—gradually are approaching the antiknock qualities of the fuels used by the airlines. With some new-car announcements still to come, one manufacturer already has a vehicle in production with a 9:1 compression ratio. That requires an antiknock rating within six or seven points of the airlines' 100-octane. The 9:1 car operated without a whimper even on the West Coast, where gasoline quality is the lowest in the U. S.

Continental coming back

FORD has confirmed the rumor that it will introduce during 1955 a "high-quality, low-volume" automobile to be known as the Continental . . . "a very modern version" of the Lincoln Continental produced from 1940 to 1948.

Glamour only skin deep

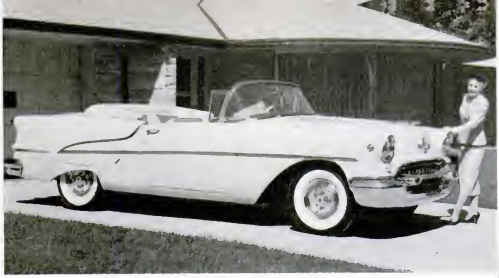
IT'S a good thing that you can't peek under the hood of some of the new cars so glamorously pictured in the newspapers on announcement day. You might not find an engine there. Used strictly for publicity-photo purposes, these automobiles sometimes contain no machinery whatsoever.

Wait'll next year . . .

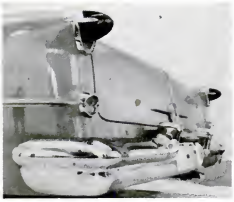
DON'T look down your nose at your favorite car if it doesn't show much change in looks from 1954. It may be that 1955 is just not its "styling year." Customarily, auto makers change body dies completely only every three years. Mechanical refinements, year to year, are far more numerous than styling changes.

Happy New Year!

POPULAR SCIENCE MONTHLY's automotive writers are striving to gratify your curiosity about new cars as fast as possible. Reports on the 1955 Pontiacs, Studebakers and Chevrolets appeared in the November issue. A dozen new cars are featured in this "auto show" section this month. There'll be more newsy articles about American cars—including a detailed tabulation of 1955 car specifications—in future issues.



RACY LINES of new Oldsmobile are accented by strip of stainless-steel molding that dips from rear doors and then spears forward past the front fender opening. Shown here on both Super 88 (left) and Series 98 (below) this strip provides color separation in two-tone jobs.



STYLING CHANGES include bullet-shaped tail lights (left) that combine rear light, stop light and turn signal. Only back-up lights are separate. Trunk lock is concealed in the emblem, which has a ring around it to serve as a handle. New front end (below) features recessed headlights, flattened parking lights, redesigned emblem.

FOR years now, man and boy, it has been said that only a dunce will try to beat an Oldsmobile away from a traffic light. For 1955 the advice is still as good as gold unless you drive a sports car or drape carburetors all over your engine.

The newest editions of this automobile are up in torque and, of course, horsepower. Olds has always used its valve timing for the best push at the rear wheels in the lower and middle-speed ranges.

A Super 88 four-door sedan toting four passengers will reach 60 miles an hour from taw in 10.8 seconds. That's with fourth gear on the Hydra-Matic transmission locked out. As an indication of take-off torque, the car is only 9/10 of a second faster in reaching 60 when the accelerator is mashed from a steady 10 miles an hour.

The time from a steady 40 miles an hour to 60 is a mere 5.5 seconds, and that from a steady 50 miles an hour to 70 only 6.5 seconds.

The performance is due to high torque output—330 pounds-feet at 2,400 revolutions of the engine for both Super 88 and

Olds Holds Take-Off Title

Again it's at the top in breakaway performance, thanks to a hefty hike in engine torque at low and middle speeds.

Series 98 lines. For 1954 the torque was pegged at 300.

Horsepower is up from 185 to 202 at 4,000 r.p.m., and the compression ratio from 8.25:1 to 8.5.

The regular Olds is only a couple of steps behind. Torque on the 88 is up from 295 to 318 at 2,000 r.p.m., and horsepower from 170 to 185 at 4,000.

You think you can't get air conditioning in a convertible? Try Olds. That's possible because the ducts carrying the cool air have been ripped out of the sides of the roof and put down on the dash. Twin, adjustable nozzles protrude from either side of the panel.

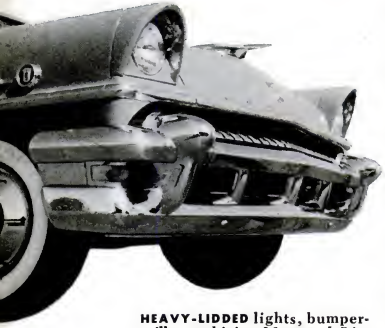
The entire air-conditioning system is a lot simpler and lighter, too. All that apparatus in the trunk—the evaporator—is now lodged entirely in the engine compartment. More cooled air comes in, even at engine idling speed, and every molecule of it is fresh.

The Olds ride for '55 is even smoother on rough roads, due largely to a new type of softer front shocks.

Tubeless tires are standard equipment.—*Devon Francis.*

Mercury Grows Faster and Sleeker

A bigger engine kicks up power to 198 hp. and handling is improved to match. There's a new line, too —it's low, lush and multicolored.

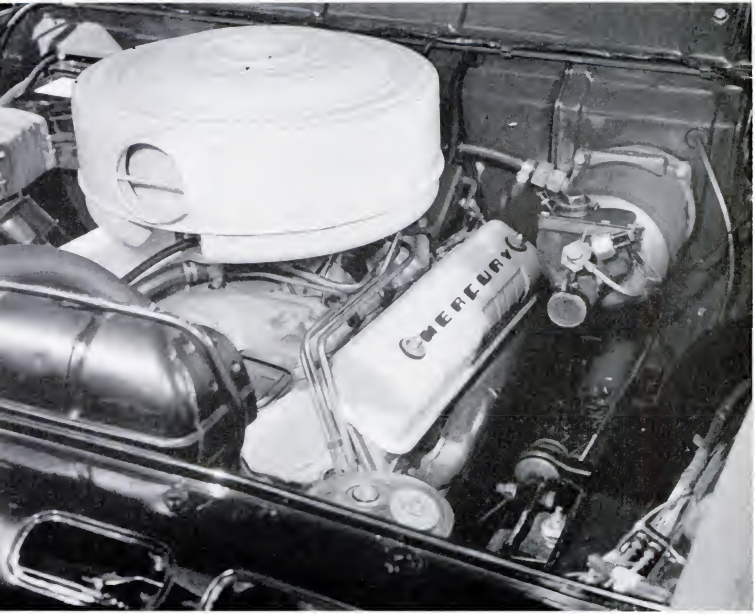


HEAVY-LIDDED lights, bumper-grille combining Merc and Lincoln touches, are recognition features in front. In back: new tail lights and flattened dual pipes.

ACCORDING to some curbstone critics, a Mercury can vary in virtue from year to year, like wines and ball teams. "Take that Klunkpot Six," one of these sidewalk sages may say, "and you've got a heap that never changes much, and never does much except keep going. Take Merc, though, and you just don't know. One year she's hotter'n a pistol; next year, she's apt to be throbby or bulgier than a lady buffalo."

If there is a nubbin of truth in this folklore, which seems possible, note down '55 as having all the earmarks of a vintage year for Ford's big brother. On specs, Mercury is at or near the top of its class in most categories. On looks, it's sleek enough to draw whistles. And on the high-speed track it is a doozy to drive —quick, smooth, and surefooted. It is the kind of car you would want as a good companion on a long, fast trip.

Performance. Driving an automatic-transmission sedan, I clocked zero-to-60 accelerations of 13, 12.8 and 12.5 seconds, which is right up with the best, and faster than any fully grown driver should want. The more important 50-to-70 time —it establishes highway passing ability— was a flashing 7.9 seconds. Top speed is about 107 m.p.h. true with an automatic drive, and a mile or two faster with over-



TOADSTOOL air cleaner hides redesigned four-barrel carburetor underneath. They're getting the engine-room clutter under control—this job has both power steering and power brakes.

PIE-FACED instrument panel is easy to read. Hump in floor looks high (it's about one inch higher than in '54) but a six-footer can still take the middle position without contortion.

LUXURY of the new Montclair line, which pushes the Monterey down to middle spot in fanciness, is symbolized by medallion behind rear armrest. It lights up, but doesn't say "Tilt."

ONE FINGER unlatches hood, though safety catch is retained. First part of finger's travel unlocks main catch, and further movement then releases the separate "anti-fly-open" catch.

MERCURY CUSTOM is the Plain Jane, though not exactly stark. Note Merc-identifying "mump" just ahead of rear wheel. Ground clearance, down .6 inch, is still a healthy 7.2 inches.

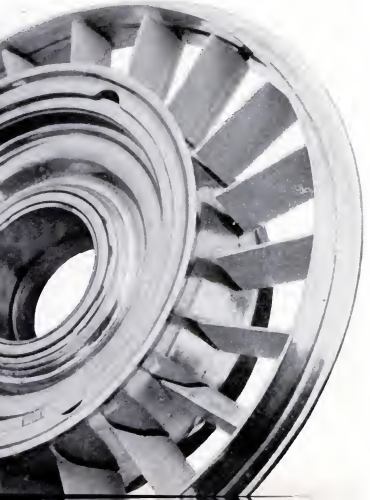
drive. Handling is there to match. They've lowered the car a couple of inches, tacked an inch on the wheelbase (now 119), and added a fat three inches to the rear tread. They've jiggered the spring rates, changed the shock valving, and held weight very close to '54's 3,700 pounds. The result is a sweet road car—one of the handful of U.S. cars at any price that doesn't itch for the ditches at speeds over 80. About the only thing that may sadden you is the steering ratio, which remains at 25.4-to-1 over-all. It feels all right but is a trifle slow for a joyous temperament.

More engine. This showy behavior (the accelerations press those of the '55 Lincoln) springs from a 292-cubic-inch engine, up 36 inches this year. (The stroke has increased from 3.1 to 3.3 inches; the bore has grown from 3.62 to 3.75) At 8.5-to-1 compression and with dual exhausts, it delivers 198 horsepower. At 7.6 compression and with dual headers feeding one muffler, it produces 188 hp. The torques of the two versions are 286 and 274 pound-feet, compared to last year's 238. While the higher-compression job wants premium gas, Merc engineers swear the 7.6 one will run on regular without degrading the spark timing.

There's more changed about the engine than the displacement. It has a redesigned four-barrel carburetor with the choke plates taken out of the air horns for freer air flow, topped by a fancy new cleaner that sucks from a big hole up front. (Prediction: watch for Merc to run a duct from this up to the front before long.) It has a new camshaft that respaces valve events to get the most possi-

[Continued on page 236]

Midget blades in the torque converter change the oil flow for kickdown.



Buick 'Kicks Down' For Quick Passing

Dynaflow transmission pinches an idea from airplane props to add push to the rear wheels.

A COUPLE of years ago the Buick people sat back and took a hard look at their automatic transmission. It was only five years old. It was newly improved. But it needed something else. It lacked a "kickdown" into a lower gear ratio, like that on other automatic drives, for passing.

Last month the results of the hard look, and of intensive research, were announced. For 1955 Buick has a kickdown.

But it's different. To understand the change in Dynaflow, Buick's pioneering effort in torque converters for passenger cars, you must understand the company's insistence on a silk-smooth power flow from engine to rear wheels.

All other U. S. cars equipped with

SECRET OF EXTRA BURST OF SPEED lies in putting Dynaflow's stator blades in flatter pitch, as shown in top photo. In bottom photo blades are in cruise position. Spring-loaded annular piston has constant 45-pounds-per-square-inch oil pressure on side pictured. Piston moves, cranking down blade pitch, when 45-pound pressure on other side drops.

New tail lights, recessed honeycomb grille distinguish new Buick.

STYLING CHANGES on outside cover head and tail lights, grille, bumpers, rear fenders, hood emblem, "portholes," wheel disks, deck-lid emblem and—on Super and Roadmaster series—rear-window molding. Tubeless tires are standard except with wire wheels. Revised transmission gives Super series as much as a mile more per gallon of fuel. All Buicks except the Special are upped to 9:1 compression.

torque-converter transmissions have a box of gears behind the converter to step up the performance. The gears shift—just once—as the car takes off and gains speed. The transition results in a thump. For passing, the motorist merely presses harder on the accelerator. That downshifts the gears, like going from high gear back to second with a manual shift.

Buick has had no shift, no thump. But neither has Buick offered the customer that sharp increase in engine authority for passing.

Now Buick does, without shift or thump. This was accomplished by borrowing an idea from the airplane industry. In an airplane equipped with a fixed-pitch propeller, the pitch has to be set midway between the best thrust for take-off and the best thrust for cruising.

The compromise, like most compromises, is unsatisfactory—take-off time is lengthened and cruising speed suffers. With a prop that can be altered in flight, however, at take-off the pitch can be flat. In cruise, the prop can take a bigger bite of air.

The oil-filled innards of the Dynaflow transmission, like those of all torque-converter drives, contain the equivalent of the elements of an airplane prop. It's called a stator. It's a little wheel with curved blades on the hub.

SELECTOR QUADRANT for automatic transmission has been moved halfway down steering wheel post. Three-spoke wheel on '55 models is narrower and has a hub of smaller diameter.

Tiny Blades Help Increase Torque

The blades redirect the flow of the oil as it comes out of the turbine and goes back to the pump so that the oil will help instead of hindering the rotation of the pump. That's what multiplies the torque coming off the engine crankshaft. It's what distinguishes a torque converter from a simple fluid coupling.

Up to now, the Buick blades, like those of other torque converters, have had a fixed pitch. It was a compromise. At breakaway the automatic drive didn't satisfy the motorist who wanted a jack-rabbit start. At cruise, it didn't give as

much zip as it should have. And it couldn't be kicked down for passing.

That's all changed now. For extra push at the rear wheels, the stator blades flatten out, giving the oil better direction as it comes out of the turbine into the pump. This boosts torque. For cruise, they swivel around to take a bigger bite of oil. This betters performance and saves gas. For passing, they flatten out again to provide an extra burst of speed.

Trigger Toes Get Bullet Performance

And the whole operation remains silk-smooth.

The results should be deeply gratifying to the motorist with a triggered accelerator toe. The 1954 Buick Super sedan, for instance, took 15.3 seconds to reach 60 miles an hour from breakaway. The 1955 Super, kicked down, does it in 12.5 seconds. The same car, kicked down for passing, jumps from a steady 40 miles an hour to 60 in 6.2 seconds, and from a steady 50 up to 70 in 7.8 seconds.

Horsepowers in all the Buick lines have shot upward again, for '55, and of course that too helps performance.

As in other torque-converter cars, the kicking down in the Buick is done through the accelerator linkage. At a given point, you have to press harder to put the blades in flat pitch.

The yardstick of efficiency for the fixed-pitch stator is how low an r.p.m. the engine will register when it is held at hard throttle against the brakes. For 1955, Buick's engine speed *without kick-down* has dropped several hundred revs.

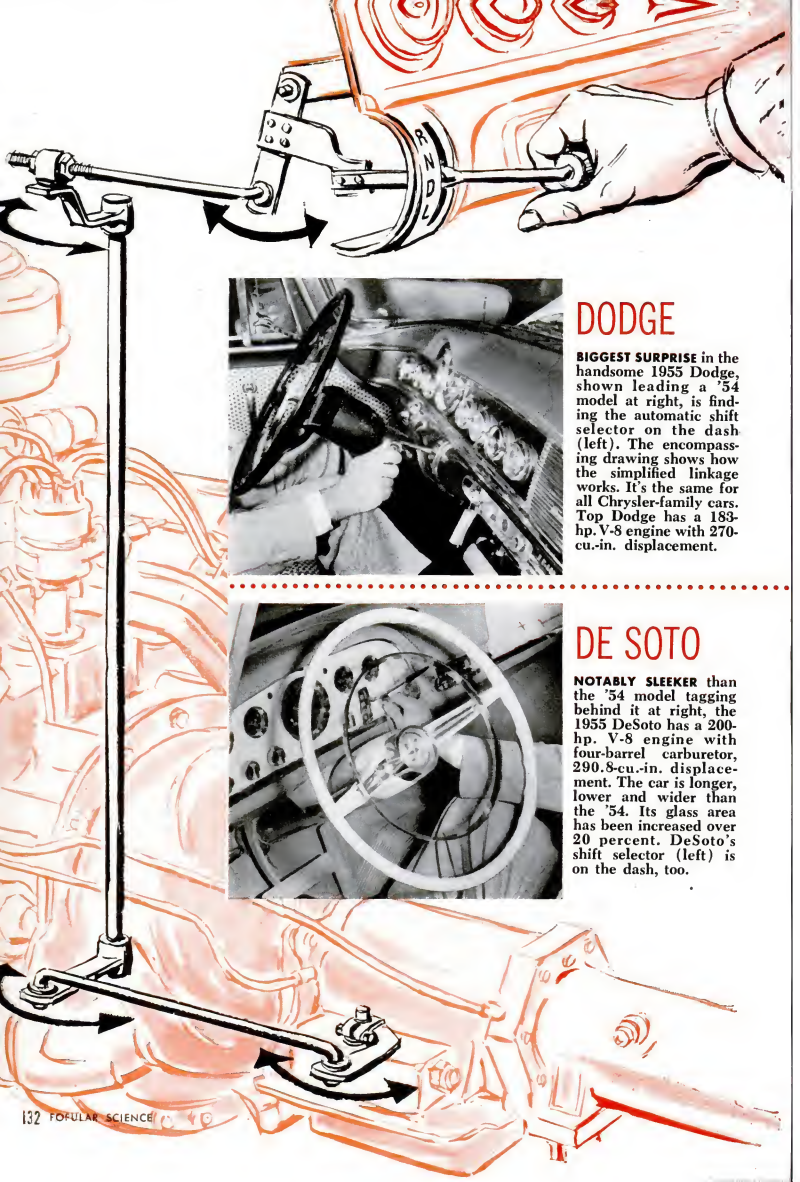
But kick it down, and the r.p.m. shoots up. From a standing start, that eats gas. The jack-rabbit performance comes not only from a greater torque multiplication but also from the higher engine speed and more torque from the crankshaft.

Gas-wise, kicking down at cruising speeds is less critical—the engine doesn't have to work so hard to increase the car's speed, once the rear wheels are turning smartly.

Century, Super, Get Roadmaster Holes

Buick has made another change for '55 that will confuse all but the professional car-recognition experts. It used to be that four fender "portholes" marked the top of the company's line of cars, the Roadmaster. Now the holes, round instead of elliptical as in '54, number four on the Century and Super lines, too.

The reason is that all have the same horsepower, a whopping 236. Only the Special, with a meager 188 horsepower (shades of 1951 when the Cadillac boasted about a mere 160 horsepower!), has three holes.—*Devon Francis.*



DODGE

BIGGEST SURPRISE in the handsome 1955 Dodge, shown leading a '54 model at right, is finding the automatic shift selector on the dash (left). The encompassing drawing shows how the simplified linkage works. It's the same for all Chrysler-family cars. Top Dodge has a 183-hp. V-8 engine with 270-cu.-in. displacement.

DE SOTO

NOTABLY SLEEKER than the '54 model tagging behind it at right, the 1955 DeSoto has a 200-hp. V-8 engine with four-barrel carburetor, 290.8-cu.-in. displacement. The car is longer, lower and wider than the '54. Its glass area has been increased over 20 percent. DeSoto's shift selector (left) is on the dash, too.

These Cars Made a Hit Even in Disguise

Masked '55 Dodge and DeSoto collected crowds on 800-mile mystery run four months ago.

By Wesley S. Griswold

"MAN, those are real cool cars!" The speaker was a 17-year-old lad in blue jeans, who was standing on an Ohio street corner one hot morning last July. A mysterious cavalcade of automobiles, wholly unrecognizable to this connoisseur of body lines, had just rolled past him and drawn up to a nearby filling station.

Though there was no way for him to tell at that moment, he was looking at 1955 Dodges and DeSotos, out for

an unheralded test run in disguise.

The young man raced over to the pumps, scowled for a frustrated moment when he discovered that masking tape covered the names and insignia of the cars, then proceeded to admire their sleek contours.

The New Look: Longer, Lower, Fleeter

He had to ask the names of the cars, for there was little in their looks that related them to the 1954 models, with which he was familiar. Once they had been identified, he could easily see that the '55 jobs, not to be shown to the U.S. as a whole until four months later, were longer, lower, fleeter looking and a bit wider than their predecessors. Their headlights were hooded, their windshields the wraparound type.

Friendly drivers in the halted cavalcade permitted the young man to discover for himself that the automatic-transmission selector had been taken off the steering post and mounted on the dash. He spotted the tubeless tires and found out that they would be standard equipment for the '55 models.

BIGGER FUEL TANKS, with fill pipes tucked away behind the spare tires to make more luggage room, are incorporated in both the Dodge and the DeSoto (above).

Auto engineers, along on the trip, answered his questions about engine changes, revealing that the biggest Dodge would put out 183 horsepower (up 33 from 1954) and the biggest DeSoto would produce 200 (up 30 from 1954).

By this time the fuel tanks, bigger than ever before, were brimming and the little group of cars was ready to move on.

On through the baking Midwestern countryside swept the small parade of masked cars, as free of identifying marks as a spy in enemy territory but as conspicuous as a popular movie star in dark glasses.

For 800 miles these 1955 Dodges and DeSotos, normally protected from the public gaze by elaborate security measures, traveled a widely varied route through states adjacent to Michigan.

One popeyed car dealer hopped into his own vehicle and followed them for miles until they stopped for the night and he could satisfy his curiosity.

At the big motel where the drivers stayed, guests and local people quickly gathered around the parked cars, opening doors, fingering levers, subjecting the drivers to an insistent quiz.

The public's reactions, as well as the drivers' own, were duly reported when the cars had disappeared once more behind the guarded gates of the Chrysler Corporation's new proving grounds at Chelsea, 65 miles from Detroit. The terms of the report would have piqued your interest as much as a first glimpse of the cars.

Opposite a check list running from "Appearance" to "Wipers," and including "Body Shake," "Instruments," "Prop. Shaft" and 19 other items, you would merely have found numbers. The numbers ranged from 1, meaning "Unbearable," to 10, standing for "Perfect." They represented completely candid opinions, and a test driver is a severe critic.

Immediately the plant laboratories and the proving-ground staff went to work to eliminate the kinks that had provoked low-number comments.

So intrigued are the test drivers by this numerical lingo of theirs that they often use it off duty. When one of them wants to alert the others to the approach of a pretty girl, he may yell, "Here comes an 8½!" That means that the young lady is rated better than Excellent, just a shade below Superior.

Mountains and Desert Test New Parts

Before the 1955 Dodges and DeSotos made their shakedown cruise through open country, every new component but the shells had already been through se-

[*Continued on page 246*]

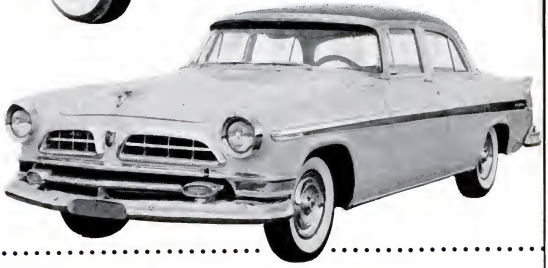
Top Horsepowers Go Still Higher

CADILLAC

at 240 horsepower has a compression ratio of 8.75:1, up from 8.25. Higher valve lifts and rocker-arm ratios add zip. Options in one model hike power to 265.

LINCOLN

at 225 horsepower has a compression ratio of 8.5:1, up from 8. Displacement is boosted from 317 to 341 cubic inches, higher than Caddy's or Chrysler's.



CHRYSLER

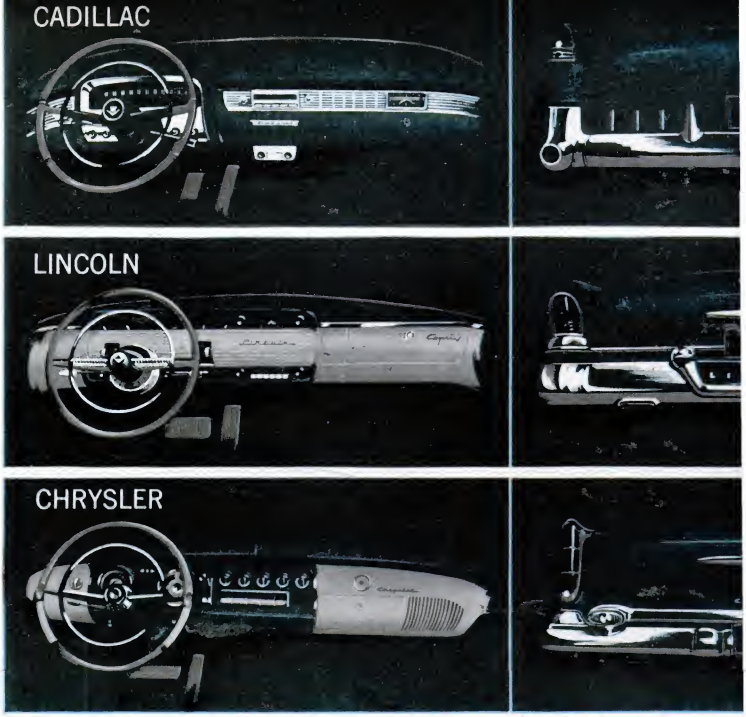
at 250 horsepower also has an 8.5:1 compression ratio, up from 7.5. Revised carburetion peps up performance. For first time, car requires premium fuel.

It was oomph, not speed, the engineers were aiming at when they jacked up the torque in the new crop of "brute" cars.

By Devon Francis

THEY have a saying in Detroit, home of the horseless carriage, that nobody knows what the horsepower of a new model is going to be until the sales department has announced it in the public prints.

Like all generalizations, this one is



Cadillac and Lincoln have been prettied up fore, aft and inside, while the Chrysler has

only partly true. But it's close enough to the mark to make the engineers run a temperature.

Last month, with a shower of new-model announcements, the men with the slide rules were sore again. Horsepowers —again—were up. Sales departments—again—were telling the customers that here was the hottest thing on wheels.

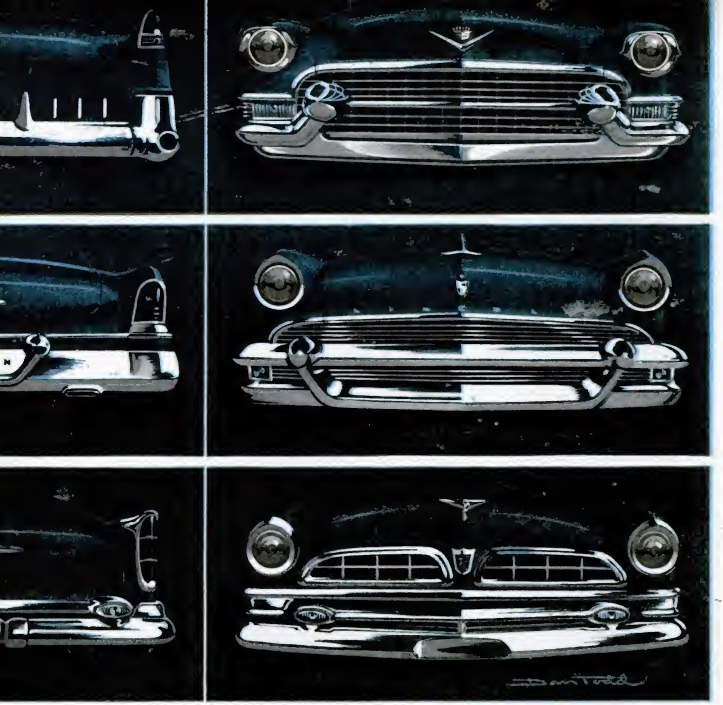
Horsepowers in the chi-chi car field, naturally highest, crept inexorably toward the 300 figure. This was almost twice the horsepower of the brawniest of the heavyweights five years ago. Chrysler was up. Cadillac was up. Lincoln was up. And, come Packard's exposure to public view after the turn of the year, it certainly would be up, too.

As this magazine went to press, Chrysler for '55 stood at 250 hp., up 15 from '54. Cadillac was at 240, up 10, with an option in one model of an even wilder 265. Lincoln was at 225, up 20.

But there were telltale signs that the engineers, at long last, were making with the facts, even to their sales departments. They had raised the horsepowers, true, but only incidentally. Their real interest was twofold: gas economy and brisker performance at low and medium speeds.

Farther and Faster—on Less Gas

All three of the brute-size automobiles will go farther in 1955 on a gallon of gas —up to two miles more. All three will show more snap when the light turns



a series of new bodies that are up to three inches longer, and an inch and a half wider.

green. All three will cut out and around a car ahead on the highway and ease back into lane in fewer seconds.

The fuel economy is due to higher compression ratios that squeeze more oomph out of the gas, and to low rear-axle ratios that slow down engine revs.

"Breakaway" and passing performance results from added torque, not horsepower. Torque is what plasters you to the back of the seat when you hit the accelerator. Torque is what the sales departments have never bothered to explain.

Well, the engineers have given the sales people their lumps for '55. They've produced torque. Stressing torque, the engineers take top-speed performance—a product of horsepower—for granted. The new Chryslers, Cadillacs and Lincolns will all break three digits on the speedometer going away.

All three cars have tubeless tires.

All three offer the extras that can easily add $1,000 to the base price—power steering, power brakes, power seats, automatic windows, and air conditioning. Automatic transmissions are standard on the Caddy and Lincoln. They are still optional on only one Chrysler line.

Now take a look at them individually:

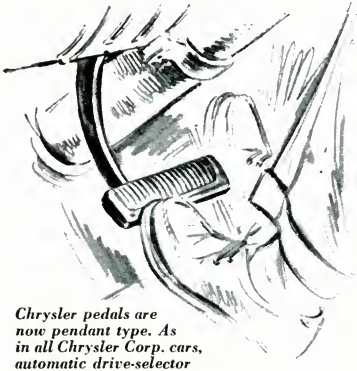
CHRYSLER As a sample of the new line of Chryslers, the New Yorker De Luxe may well be the prettiest brand-new automobile of 1955. It's longer. It's lower. The roof slants inward

more from the car waist. The design lines, to quote the lyrical press releases, are "taut."

"We want a car," Ed C. Quinn, president of the Chrysler division, told his stylists when the vehicle was in the planning stage, "that will do the same thing for a woman that a mink coat does."

That was in 1952. The car was scheduled for introduction in 1956. To get a hold in the fine-car market, which had been almost wholly proselyted by Cadillac, Chrysler advanced the announced date a full year.

There were thousands of problems, among them the one of deciding what kind of posts to put on the new wrap-around windshield. In the clay-model stage, experimental posts were tried out that pointed alternately at the moon, the sun and the intersection of New York's Lexington Avenue and Forty-second Street.

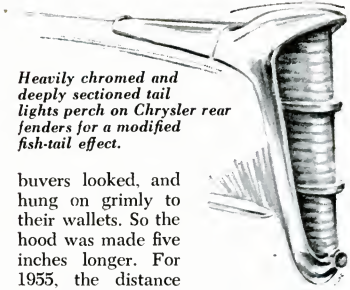


Chrysler pedals are now pendant type. As in all Chrysler Corp. cars, automatic drive-selector lever is on dash.

Quinn thinks the one chosen is well-nigh perfect for eliminating hazardous blind spots.

A minor question was whether to attach an ornament to the sports-car-type hood. The sales and advertising people voted. Half were for, half against. In the end the ornament went on.

The hood had been too short. Potential



Heavily chromed and deeply sectioned tail lights perch on Chrysler rear fenders for a modified fish-tail effect.

buyers looked, and hung on grimly to their wallets. So the hood was made five inches longer. For 1955, the distance from the front of the engine block to the tip of the front bumper is a full yard.

Quinn, a six-foot, 200-pounder with an eye sharpened by bear hunting in the Rockies and Alaska, happily points out that the new Chrysler has borrowed a couple of items from the K-310, a Chrysler dream car of 1953. One is the hood lines. The other is the push-pull type of door handles.

Mechanical improvements are legion. The Chrysler has torque to spare. It can accelerate from zero to 60 with two people aboard in 12.1 seconds.

There's No Shortage of Horses

It has one foot-pound of torque for every 12.7 pounds of car. And, if you are interested in power, its pounds-horsepower ratio is right down there with 17.3:1. It also figures out to .79 horsepower for each cubic inch of cylinder displacement. A low rear-axle ratio of 3.36-to-1 helps gas mileage.

The power-brake mechanism is combined with the master cylinder for compactness. Springs are outboard of the frame at the rear to reduce body roll. Airplane-type shocks replace the lever type in front.

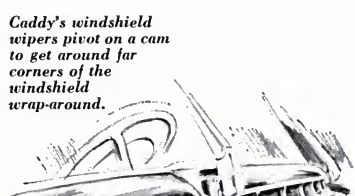
The Chrysler Windsor De Luxe line (nothing is plain any more, it's all De Luxe), less fancy than the New Yorker De Luxe line, has a new V-8 engine with smaller holes for the pistons and, unlike the New Yorker, single rocker arms for each bank of cylinders. Horsepower is 188. Chrysler will no longer produce a six-cylinder Windsor.

CADILLAC In 1954 Cadillac produced a huge share of the "fine" cars sold off the showroom floors. It's the only car that still has a buyer waiting list. So, with a good thing, Caddy isn't cottoning to much change in looks.

The bumperettes—"Dagmars" to Detroit—are bigger for '55. That distinctive molding marking the start of the rear fender is now interrupted.

But mechanical refinements are numbered in the dozens. The ratio in first and third gears of the transmission has been changed to supply added torque for take-off and passing. Air tubes bypassing the butterflies on the carburetor obviate any tinkering with the idling speed, once it's set. A bleed-off for gas vapor when the engine is hot prevents stall in firing up. Crankshaft pins are shorter, journals wider for greater rigidity and engine smoothness.

Caddy's windshield wipers pivot on a cam to get around far corners of the windshield wrap-around.



Spark plugs are colder to accommodate a higher compression ratio. A change in valving softens the rear shocks. A boost in vacuum on the power brakes makes pedal pressures softer. And in case of vacuum failure, the pedal requires no more push than that on non-boosted brakes.

Instruments are more legible, and did you ever miss the ash tray with a cigarette on a dark night? A light has been added to it. The air-conditioning system has a bigger capacity to produce cool air, and a thermostatically controlled electric clutch on the compressor tailors its output to the temperature of the car's insides.

But maybe Caddy's biggest news is a hell-for-leather optional engine in the El Dorado convertible. This 265-hp. job has *two* four-barrel carburetors—a barrel for each cylinder. They help skyrocket horsepower but add only a smidgen to torque.

The El Dorado is no car for the guy with a bilious eye at the gas pump. Shift speeds in the automatic transmission are clear up for jack-rabbit accelerations. (Torque curves, to a point, zoom with the revs.) The tolerances in the fluid coupling are looser, to boost the engine speed as much as 800 revolutions for take-off.

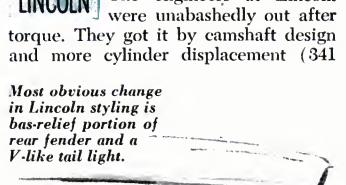
That Streak Is a Caddy

Fully loaded, the Caddy Special four-door sedan will streak from zero to 60 miles an hour in 11.7 seconds. The El Dorado does it in 10.8.

The regular Caddy develops a foot-pound of torque for every 13.1 pounds of car. Its engine totes only 18.8 pounds for each horsepower. It produces .72 of a horsepower for each cubic inch of cylinder displacement. The rear-axle ratio is 3.07:1. The comparable figures for the El Dorado: a foot-pound of torque for each 13.8 pounds of car; 14.4 pounds of car per horsepower, and .8 horsepower per cubic inch. The axle ratio is the same.

LINCOLN The engineers at Lincoln were unabashedly out after torque. They got it by camshaft design and more cylinder displacement (341

Most obvious change in Lincoln styling is bas-relief portion of rear fender and a V-like tail light.



Luxurious Imperial Leads Chrysler Line

For the citizen with scads of folding money, the Chrysler Corp. is producing for '55 a car embodying everything that a motorist could dream of: the Imperial. A hardtop version—without the center post—is pictured here.

Starting with an engine of 250 horsepower, name what you'd like. The Imperial, showpiece of the corporation's five brands of cars, has it. The car comes in two lines, Custom and Crown.

cubic inches, as opposed to last year's 317). They got a spirited 332 pounds-feet of torque as a result, up 27 over 1954. Compression ratio has gone up, too: 8.5:1 from 8. A horsepower rise was clearly inevitable.

The Lincoln hardtop with two aboard will hit 60 from a standing start in 12.5 seconds. Starting in Low Range on the automatic transmission and upshifting manually at 35 m.p.h. will clip a fractional part of a second off that.

It is the handling characteristics of the Lincoln that distinguish it. Lincoln has won the Mexican Road Race with depressing regularity, not with an exceptionally high top speed but by its agility in getting out of the "corners"—the turns—at good car speeds and high torque output. Suspension and steering help measurably.

For '55, the Lincoln at last has its own, home-grown transmission, a torque converter like that on its sister cars, the Mercury, Ford and Thunderbird, to replace the Hydra-Matic. And, like the others, it can be shifted into low for quicker take-off by a harder push on the accelerator (PSM, Oct., p. 131). The Lincoln people are calling their new transmission Turbo-Drive.

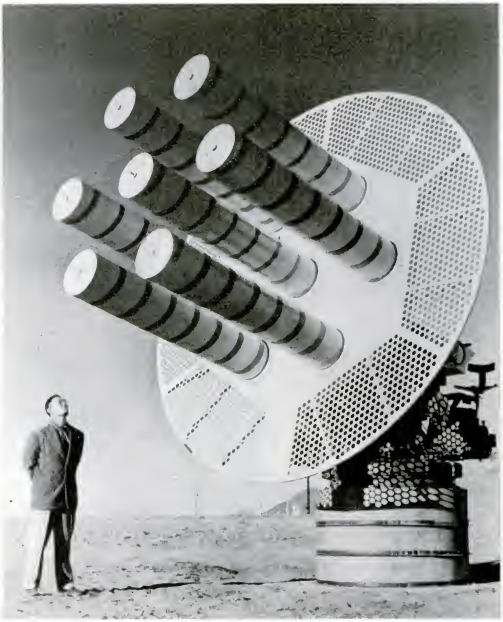
Exhaust Pipes Double Up

There are other improvements. A new air cleaner cuts down the restriction of air to the carburetor. Dual exhaust pipes—and bet your bottom dollar that this idea originated with the sales department—reduce exhaust back pressures a bit to facilitate engine breathing. New valving and mountings of the shocks improve the ride.

As with Cadillac, the styling has been touched up here and there.

The Lincoln Capri hardtop has a foot-pound of torque for each 13.4 pounds of car. The car weight works out to 19.8 pounds per horsepower. The OHV V-8 produces .66 of a horsepower for each cubic inch of displacement. For gas economy, the rear-axle ratio has been cut from 3.31:1 to 3.07. END

'Barber Poles' Keep Tabs On Missiles



THIS odd-looking contraption is a target for data radioed back from guided missiles in flight. For "automatic positioning of telemetering antenna," it was nicknamed the "apota" at the Government's Sandia Laboratory in New Mexico where Western Electric is working on military applications of atomic energy.

▶▶▶Work on the first atomic submarine has turned up new facts on water. When very hot and under pressure, its power to rust is far greater. At 600°—under pressure that keeps it from boiling at the normal 212°—it disintegrates aluminum and magnesium in hours.

What You See Inside a Flea with This New X-Ray Microscope

A COMMON dog flea looms up like some translucent monster when seen through the new X-ray microscope at right above. The instrument has an electrostatic lens system that provides an X-ray source 300 times smaller than a human hair. The image produced when the rays penetrate an opaque object is magnified up to 1,500 times, revealing the structure of metals and living tissue. General Electric expects to produce the device for use in medical science, biology and industry.

Huge Plastic World Lights Up at Night

It took 1,000 pounds of plastic and two years of work to make this giant outdoor globe for a Racine, Wis., factory. Sea-green Plexiglas wedges inset with continents in relief are fixed to a steel framework. Bronze clips permit contraction and expansion with changes in temperature. Symbols on the 11-foot illuminated sphere mark Johnson's Wax plants and offices all over the world.

Helmet Earmuffs Block Out Jet Roar

Just a big noise—that's life on a test ramp for jet engines. Special mufflers cut down the roar; but to bring it to a safe level, mechanics at McDonnell Aircraft (right) wear helmets that deaden the sound.

Two-way-stretch inserts keep built-in pads of sponge rubber snug against their ears and the sound-sensitive mastoid bones.

Piano Weighs Only 75 Pounds

You can carry this piano with you. The 75-pound electronic instrument uses reeds instead of strings, plays through earphones or a radio. Invented by B. F. Miessner, it will be made by Rudolph Wurlitzer Co., 165 W. Adams St., Chicago.

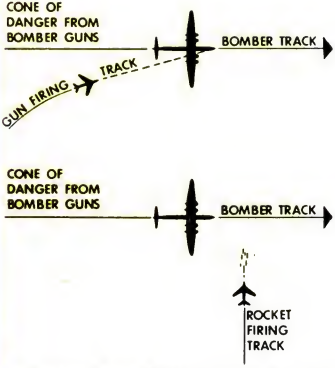
Midget Dryer Warms Room

The Dryette above will tumble-dry lingerie or baby clothes in a few minutes. Turn on the heat alone, and it will also warm up the room. With a hose attached it's a hair dryer. Tibbits Mfg. Co., 34 W. Chestnut St., Alliance, Ohio, makes it.

Radar-Aimed Rockets Blanket Target With Shotgun Pattern

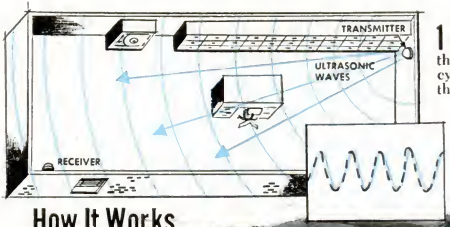
"JUST like duck hunting." That's how our Sabrejet pilots describe a new Air Force interceptor technique. Leading the target while moving in on it broadside, the F-86D sprays out rockets in a shotgun pattern to bring down its quarry while on target only a few seconds. By flying a lateral "collision course," the interceptor avoids the bomber's tail guns and forces it to defend itself from an attacker that is rapidly changing its angle of approach.

Actually, the Sabre pilot never sees his target but watches a pinhead-sized blip on his radarscope. If he keeps that properly centered for two or three seconds, he's certain of a hit. Automatic computing machinery lowers the plane's rocket pod and fires the Mighty Mouse rockets when within range. One hit will bring down a bomber.



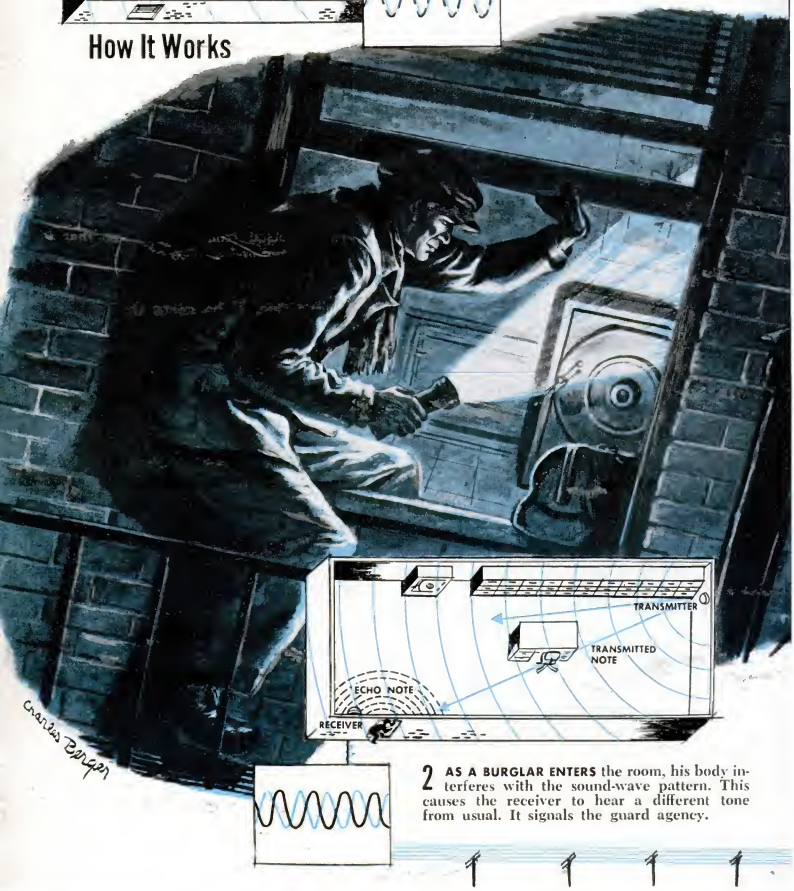
ROCKETS STREAM OUT to intercept cloth target (top) by crossing its path at precisely the right instant. Target passes through the shotgun pattern and emerges showing hits (bottom).

GUN-FIRING FIGHTER making a pass at a well-defended bomber must enter a deadly cone of fire from the enemy's tail guns. With rockets, fighter makes safer side approach.



How It Works

1 NOT A CREATURE IS STIRRING, not even a mouse, but a transmitter on the wall is steadily sounding a 19,200-cycle note, heard only by a receiver on the other side of the room.



2 AS A BURGLAR ENTERS the room, his body interferes with the sound-wave pattern. This causes the receiver to hear a different tone from usual. It signals the guard agency.

The 'Space Patrol' That Nabs Burglars

Sound waves that you can't hear, guard valuables so cleverly that they catch thieves in the act.

By Edward D. Fales Jr.

A BURGLAR was spending a busy Sunday in Newark, N. J. At six a.m. he jimmied into a liquor store. At four p.m. he sawed a padlock and stole the Saturday-night receipts from a grocery store. Feeling his professional oats, he then, at midnight, climbed to the roof of a jewelry store. For days he had cased the store for photoelectric beams, tinfoil window tapes or night watchmen. With a master's skill, he had figured out a foolproof way to enter, by cutting a hole in the roof.

He worked fast, jimmied the skylight, lowered himself inside the store. Four minutes later he was scooping $40,000 worth of diamonds into a bag.

That was when the "space police" arrived. They burst through a door and walked in with drawn guns. But there was no fight. Professional burglars are born gamblers, and this one was no exception. "I lose," he said. "Where did you guys come from?"

There was utter disbelief in his eyes and disgust in his voice. He knew there had been no one near the store, and he knew he hadn't tripped any of the Newark District Telegraph agency's regular alarms.

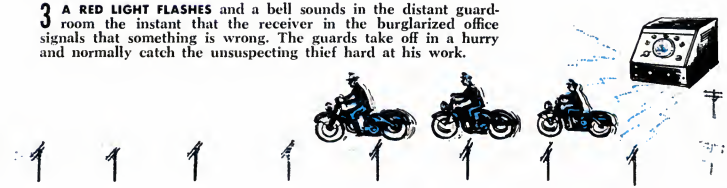
New Device Is Unfair to Burglars

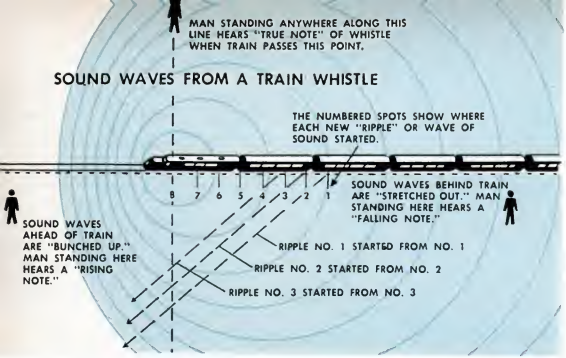
A detective pointed to an inconspicuous little box on a wall. "You set off our new space alarm," he said. "You can't hear it, but it hears every move you make—even your breathing. In fact, it's going to put you fellows out of business."

"Holy cow!" the burglar complained. "That's unfair!"

This case was related by Manager Frank Guibert of Newark

3 A RED LIGHT FLASHES and a bell sounds in the distant guardroom the instant that the receiver in the burglarized office signals that something is wrong. The guards take off in a hurry and normally catch the unsuspecting thief hard at his work.





WHY IT WORKS: A train whistle seems to rise in pitch if the train is moving toward you, and fall if the train is moving away. This is the well-known "Doppler effect." Another aspect of it is that even if both the train and you are standing still when the whistle blows, its tone will sound slightly different to a sharp ear if a moving object happens to go by at the time, reflecting the sound waves. The Kidde ultrasonic burglar alarm utilizes this principle.

District Telegraph, first detection agency to use space alarms on a commercial basis.

The unlucky thief had been trapped by man's newest anticrime weapon—an uncanny ultrasonic alarm that makes burglary, file-rifling, or even simple trespassing, practically impossible.

The "space alarm" is the Walter Kidde Company's newest ultrasonic device. It's catching burglars faster than you can swat flies.

In Manhattan not long ago Seaboard & Western Airline was having burglar trouble in its freight warehouse. So the Kidde people installed one of the new space alarms.

Screwdriver Sounded the Alarm

"One night," they reported, "the detective agency began to get some unusual signals. The red alarm light would flicker for a second, then go out. Obviously no one was in the freight house or the light would stay on and the bell would sound. It looked like equipment trouble, so a man was sent by subway, rather than in a squad car, to find the trouble and fix it.

"But when he entered the building he heard someone running off the roof. A burglar had been jimmying the skylight—and our faithful equipment, not having disturbance enough to send us a full-fledged alarm, had still managed to give us a fluttering signal every time the point of the burglar's screwdriver came through the skylight!"

In Texas a businessman had been robbed so often he got mad and ordered a space alarm installed in a hurry. The technicians stayed on the job until 11:30 p.m., finishing the installation. Then they went back to detective headquarters to check the line. As they arrived, they found something was wrong. The alarm was "ringing in" when it shouldn't have been.

The weary engineers went back again to the business place and had the surprise of their lives: They'd caught themselves a burglar—30 minutes after the installation.

"We used to get them while they were working," says Newark's Frank Guibert. "But now we get 'em before they even get started!"

Space-alarm experts have learned to be surprised at nothing. There are 700 alarms in use today, and surprises began with the very first one installed.

One surprise case involved a big appliance store in Newark.

Police Set a Trap

"For two nights," says Frank Guibert, "District Telegraph had been getting alarms from this store. It was a huge place, 250 feet long, with lots of air space. The rooms were filled with washing machines, radios, jewelry, TV sets and so on.

"The first night we rushed men by car but found nothing wrong. Obviously it was a false alarm. But when we made

line tests, everything checked out perfectly okay.

"Next night, toward midnight, the alarm came again. We were there within three minutes, turned on the lights, but saw nothing.

"On the third night we decided to hide in the store and wait. It was dark and deadly quiet. For a while we heard nothing. At 2:10 a.m. we distinctly heard the relay click in the receiving instrument on the wall. The ultrasonic waves had detected something moving in the dark near us—something we could neither see nor hear.

"We jumped up and turned the lights on. An instant later we saw a small dark object come whizzing through the air. It came through the door from the next big room, and it flew straight toward the transmitter dome on the wall. Then we saw that it was a bat. At 2:13 a.m., we suddenly heard a door open and our other guards were there with the police, just three minutes after we heard the relay click."

Space alarms have revealed fires, windows left open, broken steampipes and employees locked in washrooms after closing hours. In one bank an alarm went off when a setscrew became loose in a big ventilating fan. The fan stopped turning but the screw was beating out a fast tattoo on the flat side of the spinning shaft. This set up a vibration in the floor that tripped the alarm.

They Caught Too Many Rats

Space alarms can be set for great sensitivity—or less sensitivity. Rats used to cause alarms until engineers found so many buildings rat-infested that sets had to be adjusted to ignore them.

A minister not long ago reluctantly agreed to use a space alarm to catch someone who was stealing the collections.

Twice the alarm went off when children were playing in the parish room. Each time, detectives arrived immediately.

But one day the alarm did catch the burglar—a member of the congregation.

DOME-SHAPED TRANSMITTERS of the ultrasonic alarm system here protect a museum's treasures. Sometimes the transmitters are made to look like molding strips and guard each showcase.

ALARMS YOU CAN HEAR and see come from this box in the detection-agency guardroom when one of a client's ultrasonic receivers signals trouble. Wall panel tells just where the trouble is.

The minister was profoundly distressed but found comfort in philosophy.

"Oh, well," he said, "a congregation is like the River of Life. In every congregation there are a few tadpoles."

Commented a Kidde engineer: "We've caught burglars, bats, rats and kids. But that's the first time we ever caught a *tadpole!*"

END

Kids' Midget Racer Is Stripped Down

A TEEN-AGER can design his own dream car around this steel chassis. Chain-driven, it has a 2½-hp. rear engine with foot throttle and a geared transmission. Axles are tubular and the one at front has cantilever action for easier riding. Midget Motors Supply, Athens, Ohio, expects the kids' car to sell for around $200.

Dummy Is Crashed To Test Plane Seat

THE dummy at left has just endured a "crash landing" in the National Advisory Committee for Aeronautics' laboratory in Cleveland. His seat is of experimental construction, with inflated back, arms and cushion and no sharp edges. A body striking it would be well cushioned. The seat will not look like this if it is accepted commercially.

Scalpel Sealed Clean

STERILE scalpel blades now come in sealed foil envelopes. A nurse can peel one open, drop the scalpel onto a sterile surface and fasten it to a handle in seconds. American Safety Razor Corp., 315 Jay St., Brooklyn, N. Y., manufactures them.

"Brain" Fits Hand

A TURN of the crank of this circular, hand-held Curta calculator enables you to solve mathematical problems from simple addition to square roots. The Curta Calculator Co. 3851 W. Madison St., Chicago, distributes it.

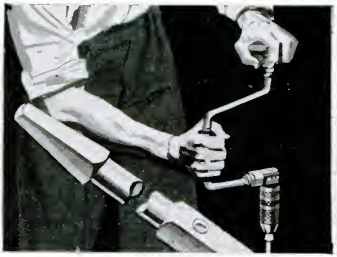
Radio Lights a Path

AS AN additional selling point for the camper, Philco has slipped a flashlight into its newest line of portable radios. The business end of it is visible above at the right. Both radio and flashlight operate from two double-size batteries.

I'd Like to see them make...

A FURNACE THERMOSTAT with projections on the dial at 60 and 72 degrees so that a near-sighted person could set it just by feel.—*Andrew M. Starr, Carmel, Calif.*

CHRISTMAS-TREE LIGHTS with electric cords covered with glitter. They wouldn't have to be hidden but could be draped like tinsel.—*Kaye Denton, Grand Haven, Mich.*



A SPECIAL SHANK, one end shaped to fit bit braces, the other square to take sockets. A Brace's two-way ratchet action is ideal for wrench use.—*R. R. Rundell, Miami.*

A PLASTIC LID for quart-size milk cartons. The containers could be cut down and fitted into refrigerator, freezer or lunch box.—*Mrs. Wm. Llewellyn, Lonaconing, Md.*

WIND-UP KEYS FOR MECHANICAL TOYS made in a standard size and sold like skate keys. Then a lost key wouldn't put a toy out of action. —*M. Salerno, Brooklyn.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE MONTHLY readers. What is *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

Gus Backs

The kids would be waiting for him but tonight Gus was miles away, playing real Santa Claus.

By Martin Bunn

GUS WILSON was just closing the Model Garage on the evening before Christmas when snow began to fall. The flakes floated slowly down in feathery loveliness. Gus washed up and, drying his work-hardened hands, looked out at the falling whiteness.

"If I had time," he commented to Stan Hicks, "I'd get out there and heave snowballs. As it is, I'd better hustle. I'm booked to be Santa Claus for the kids at the Kipp Street school tonight."

Stan grinned at the thought of Gus dressed up in red pants and white whiskers. At that moment a small, snow-covered car of foreign make turned in from the street and scooted beneath the partly lowered garage door. A pleasant-faced young sailor unfolded himself from behind the wheel.

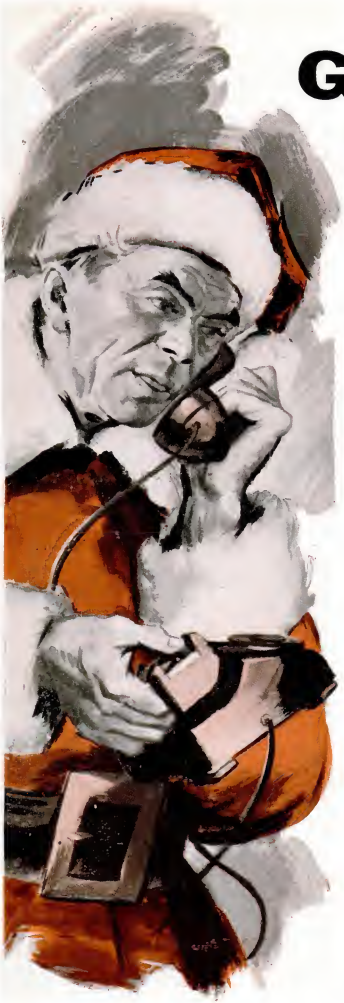
"Lucky that I got in before you closed," he said. "There's something wrong with this limey heap."

Time Out for Santa

Gus cocked an ear to the roughly idling motor. He hoped that there was nothing seriously wrong, since he would be pinched for time to get ready for his ordeal as Santa Claus. Stan, Gus knew, was shining himself up for a special date.

"Sounds a little rough," he commented.

"Maybe that's all," the sailor said, "but I can't afford to take any chances—not tonight, with the garages closing for



"Look, sailor, I'm stuck here for a couple of hours. I have to do a Santa Claus act . . ."

into Christmas

Christmas Eve, and me with a hundred miles yet to go. Around midnight I figure to be playing Santa Claus for my kid—haven't seen him for a solid year."

Gus nodded sympathetically. "Now about your trouble."

"I drove this heap right out of a used-car lot down in the city," the sailor said. "Hurry to get home—didn't eat. I nosed down into the curb at the restaurant up the street a couple blocks, and couldn't back out. Only wanted a sandwich. Guess I never had the car in reverse before."

"Couldn't back out from the curb!" Gus exclaimed. "Do you mean to say that someone sold you a car that won't go in reverse?"

"Right," the sailor said. "Doesn't have enough poop to back away from the curb. Restaurant fellow helped me push her back into the street so I could get going forward."

Little Car Behaves Perfectly

Gus got in the car, a tiny imported sedan, put it in reverse and backed it up smartly. He ran it back and forth. A foolish look came into the sailor's eyes. "Seems all right now," he said. "Maybe I'd better shove off."

Urgently wanting to close up, Gus had half a mind to let him go. After all, he told himself, this motor had less than 40 horsepower, and that street at the restaurant was high-crowned. It would take power to back from the curb there. But the brakes felt as if they'd been set up a little too snug. And that rough idle sounded as if one plug was cutting out.

Gus thrust his heavy shoulders be-

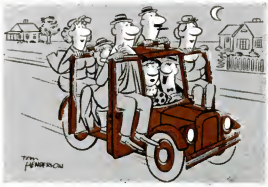
"Just didn't know anyone else to call, Mr. Wilson. I was hoping maybe I'd be home by midnight . . ."

neath the hood, ran his screwdriver over the plugs, located the weak sister and replaced it with a new one. Then he cleaned and set the others, checked the points and gave the idling screw a quarter turn.

Gus Eases the Brakes

Working with calm speed, Gus raised each end of the car with the floor jack; the rear brakes *were* dragging a bit, and he backed them off. He put a hand to the brake pedal, to check floorboard clearance and stroke length. He started the motor, listened to it approvingly, ran the car back and forth a few times on the garage floor.

"You can roll now, sailor," he said. "Take that hundred miles easy. Never mind the pay. Just call it from one Santa to another."



"You would have to open your big mouth and ask if anyone wanted a lift home!"

"Thanks a million, pal," the sailor said. "And Merry Christmas, too!"

Looking after him, a sense of unease came to Gus, but he shrugged it off. He went down the street to the restaurant and ordered a double hamburger.

"You been working late, Gus?" the proprietor inquired.

"Yeah. Had a last-minute customer. A sailor with a little foreign car. Did you see him?"

"Sure. That car wouldn't pull the hat off your head. I had to help push the thing away from the curb."

"That's what he told me," Gus said. "I wonder how a man feels when he hasn't seen his wife and kid for a whole year."

An hour later, dressed in his Santa Claus outfit, Gus was watching the kids put on the school pageant. He stood far back in the rear, where the kids couldn't see him. His enjoyment of the show was mildly shadowed by nervousness over the Santa Claus act. Thing to remember, he told himself, was to say Ho! Ho! Ho! every now and then. He was worrying the thought when Miss Davidson, one of the teachers, touched his elbow.

"You're wanted on the phone, Gus," she whispered.

Gus walked into a side room and picked up the phone.

"Hello," a worried voice said over the wire. "I've had a time getting you. Fellow at the diner said you'd be at the school now. I'm Jimmie Wilder—the sailor with the little car. I missed a turn out here. I'm not ditched or stuck—just can't back up. I'm phoning from the Sam Reynolds farm."

Glancing at his wrist watch, Gus felt a sinking sensation. The Reynolds farm was several miles out, and in 45 minutes he had to be up on the stage.

"Look, sailor," Gus said desperately. "I'm stuck here for a couple of hours. I have to do a Santa Claus act at the school, and I'm due on soon."

"Just didn't know anyone else to call," Wilder said, an infinite weariness in his voice. "I was hoping maybe I'd be home by midnight . . ."

Wrong Diagnosis

Gus was mentally flaying himself. He knew, right down in whatever prompts a mechanic's hunches, that an erratic spark plug and slightly dragging rear brakes shouldn't have stopped that car from backing from the curb.

"Stay where you are, Wilder," he said into the phone. "I'll be right out."

As Gus pulled away from the school, his tires throwing snow and gravel, he caught a glimpse of the worried face of Miss Davidson looking after him from the school door. Gus made fast time. As he wheeled into the Reynolds yard, the sailor ran down the farmhouse steps to meet him.

"Good going, mister," he breathed. "I'm about a mile down the road. Took the wrong turn. Trees and brush. Can't

[Continued on page 230]

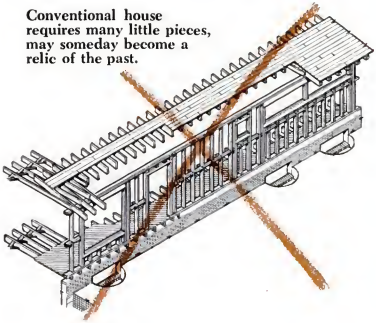
The 'Big Piece' Way to Build

Fewer parts for fewer workmen now make building garages or mansions faster—and cheaper.

By John L. Springer

REMEMBER the high, open ceilings and big exposed beams popular in Great-granddad's time? Now many architects are going back and adapting similar construction features to today's houses. The results are sleek, modern homes that cost less to build, go up faster, take fewer workmen and permit many special effects

Conventional house requires many little pieces, may someday become a relic of the past.



LIGHTWEIGHT "CURTAIN" WALLS on this summer cabin at Fishkill, N. Y. (also shown on opposite page) support no load at all, are simply strung between heavy 4"-by-6" vertical posts set wide apart. Walls don't even touch floor, as you can see by the water-drainage crack that separates porch from cabin's interior.

ROOF RAFTERS rest on 4"-by-12" girders that span full distance between cabin's vertical posts from front to back. Underside of roof sheathing provides rustic ceiling with no further finishing, saves on both work and materials. Design is also ideal for an added-on den, playroom or other informal room. By using sturdy 2" tongue-and-groove planks for roof, you get a ready-made sun deck of tremendous strength to top off a garage or porch.

not possible with conventional construction.

Called plank-and-beam, the system requires bigger pieces of lumber but a lot fewer of them, and the same timbers serve both as structural members and the finished surface. Instead of the usual two-by-eight floor joists set 16" apart, the plank-and-beam house may have three-by-ten beams 6' apart. Instead of 1" of subflooring and another ¾" of finish flooring, wide tongue-and-groove planks 2" thick may serve as both rough and finish flooring in one.

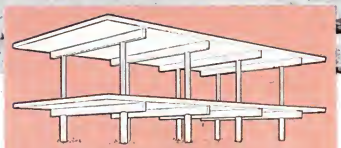
Roofs are framed the same way. Rafters are left exposed, and the roof sheathing becomes the finished ceiling. Roof loads are concentrated on heavy columns spaced wide apart so that you can put large picture windows almost anywhere without costly extra framing to span the gaps.

Small jobs are easier, too. Besides complete houses, the plank-and-beam method is ideal for weekend cabins and other small construction jobs, making it easier for homeowners to do the work themselves.

Because you have fewer pieces to handle, you can put up a small cabin or build on a house extension without the endless fuss of cutting, fitting, aligning and nailing a lot of little pieces. Adding a carport is a simple matter of extending the house roof out over three or four husky posts set in the ground. Later, if you want to enclose it to make a full garage, light "curtain" walls can be strung between the existing posts without requiring their own foundations or affecting the structure at all.

Dramatic broad-windowed sunrooms and open-view porches are also a cinch since there are few structural members to get in the way. It's the nearest thing to hanging a roof from skyhooks and leaving out the walls entirely.

Wood must be good. With fewer pieces to rely on, each one has to be top grade. Planks and beams must be well milled, well seasoned and straight. When these are delivered to the job site, they are stacked off the ground and put



WIDE PICTURE WINDOWS are easy, since non-load-bearing walls can be omitted wherever openings are desired. Entire roof load is supported on only eight posts set directly over corresponding concrete piers sunk in ground (sketch). Using piers saves back-breaking work (and budget-breaking cost) of full foundation.

under cover to protect them from the weather.

As soon as possible after delivery, and before erection, they get at least a prime coat of finish to retard moisture. Many builders using stain or shellac do the complete job on the ground. When the carpenters nail the planks in place, they're already finished.

It is also important, for appearance, to have ceiling joints straight and usually parallel to the room walls. You must make sure that planks are straight and true to a line perpendicular to the beam.

Big pieces save money. While lumber costs more per piece, using fewer pieces saves on the total cost of material and labor. By eliminating the ceiling, in effect, you also avoid the cost of ceiling joists, bridging, lath and plaster.

Using only a few floor beams also makes it possible to lower the height of basements. Alan L. Winthrop, project engineer of the Division of Housing Research of the Federal Housing and Home Finance Agency, estimated that in a house 24′ wide by 40′ long, the saving in basement construction amounts to at least 85 square feet of foundation wall, 30 cubic yards of excavation and 9½ yards of cement coating and waterproofing.

Using widely spaced ceiling beams, you can get an 8′ ceiling height although your wall studs are only 7′ high. You can make full use of stock 14′ lengths.

The National Lumber Manufacturers Association compared the cost of a plank-and-beam floor using 6′ spans with that of a conventional floor, both built by the same workmen under identical conditions near Washington, D. C.

The plank-and-beam method saved 14.7 percent in lumber and 26.3 in carpenters' time.

"Savings would have been increased if larger plank spans had been used and if carpenters had been as experienced with plank-and-beam construction as with joisted construction," Mr. Winthrop says.

New insulating tricks needed. Even enthusiastic supporters of the plank-and-

beam method warn that it is no miracle formula, however. Open ceilings make it necessary to insulate and wire differently than you would in ordinary construction. Insulating effectively is difficult in areas where winters are severe, and for this reason the method has so far been used mainly in the South and West.

Plank-and-beam builders generally use insulating materials *over* the roof planking. These are the rigid type which can bear the weight of the men applying the roofing, the roofing itself and the snow load without crushing or breaking, and they keep their insulating properties even when slightly wet.

Condensation in a plank-and-beam roof can cause rotting planks, peeling paint or a blistered, leaking roof. Careful condensation controls must be built in.

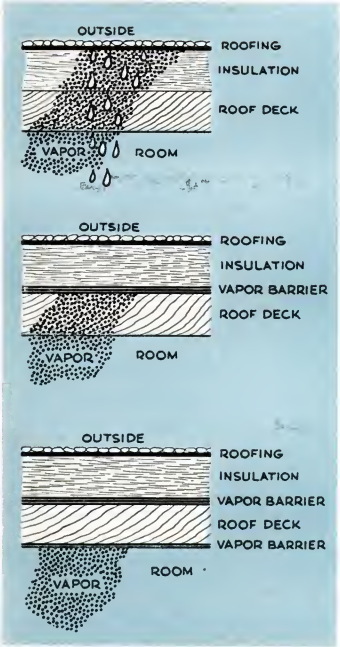
While some types of insulation need no separate vapor barrier because they are impervious to moisture, a vapor barrier installed over the planking and under the insulation will lower the chance of any low-viscosity mastic penetrating and staining the planks.

Where to hide the wires? "You must decide how to handle the electrical distribution system before beginning actual construction of a plank-and-beam house," Mr. Winthrop says. "There is no concealed ceiling space in the open-roof system in which to run the wires, and there will be no floor-joist space for electric cables if you use a concrete slab."

Some builders eliminate ceiling fixtures wherever possible and use wall fixtures instead. Others use ceiling fixtures fed by wiring in small, trim metal raceways or in built-up beams composed of two 2"-wide members separated by spacer blocks.

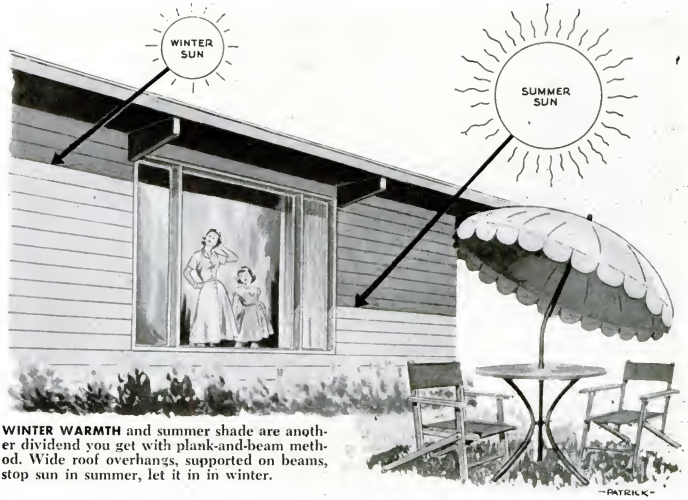
Plug-in strip molding or other surface-mounted raceways are used to feed wall outlets. The molding strip then becomes part of the trim.

As in conventional construction, the size and number of beams and posts de-



PUTTING INSULATION on outside of roof makes moisture control a must. Roof at top will soon rot, as vapor has condensed against cold outer surface and been trapped inside. Adding vapor barrier between planks and insulation (center) keeps vapor from insulation, but may let it condense in wood if barrier gets cold enough. Safest bet is barrier on both sides of planks (bottom), which keeps moisture from reaching both wood and insulation.

ROOF can be conventional peak, but is often kept flat or shallow-pitched because of simpler framing. Where shingles won't shed, as here, built-up top of tar and slag is used.



WINTER WARMTH and summer shade are another dividend you get with plank-and-beam method. Wide roof overhangs, supported on beams, stop sun in summer, let it in in winter.

pends upon load requirements and local building regulations. Single beams, however, are rarely less than 3″ thick and posts are usually at least 4″-by-4″.

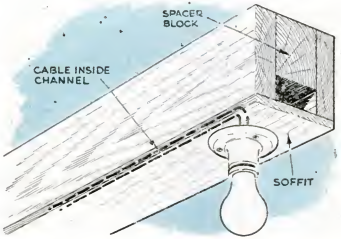
Summer cabins are a cinch. Architect Edward L. Barnes of New York used the plank-and-beam method in half a dozen cabins at the summer camp of the New York Herald-Tribune Fresh Air Fund at Fishkill, N. Y. The cabins are built on round, steel-reinforced concrete piers 8″ in diameter.

Barnes strapped 20′-long four-by-twelves to the piers to span the width and give a cantilever of 43″ on each side. Walls were placed directly over the line of piers, and the cantilevered sections served as porches. Dimensions of the cabins, including verandas, measured 20′ by 38′ 3″.

Perpendicular to the beams, Barnes placed two-by-sixes 16″ on centers and above them one-by-four tongue-and-groove flooring. All lumber was treated with termite-resistant stain before being put into place.

Four-by-six posts were set directly on the floor beams over the concrete piers to support four-by-twelve roof beams covered with one-by-six tongue-and-groove sheathing.

Whether adapted for cabins or year-round homes, the plank-and-beam method requires careful selection and cutting of the materials. But once you have them, you can reap big savings in money and time when you put the pieces together. END



HOLLOW-CORE BEAMS can be made up to hide electric cables inside by nailing two planks together with spacer blocks in between. The exposed channel is then covered by a soffit, a thin board nailed across the bottom, which gives the look of a single, solid beam.

USING METAL AND WOOD, IT'S EASY TO BUILD

Modern Accessories for A Modern Home

By Mac L. Olds

NO NEED to mortgage your future to go modern. Look what you can do with simple wooden shapes and hand-bent metal legs. Any of these items can be made in an evening or two.

Even construction lumber can be used if you finish with lacquer or enamel. If you want grain to show, choose wood that will take a nice natural finish.

Sand wooden parts and fill any defects. Seal with shellac. Finish with more shellac, lacquer, paint or enamel. For spatter effects, load a brush with a second color and tap it above the piece.

Steel, brass or aluminum rod can be used for the legs. Finish steel or aluminum with flat colors. Polish brass with steel wool and apply clear lacquer.

If you cannot get rubber feet, use push-on pencil erasers, drill bits of dowel to fit the rod, or cement on rubber tubing to project past the ends.

WATERPROOF PLANTER

ITS liner is a 5½"-by-9½" aluminum bread pan. Make a box of 1" lumber to fit it and be about 4½" deep. Butt, rabbet or miter the corners. Assemble with glue and 4d. finishing nails. Spot these at outer corners only. Cut ⅛"-deep decorative grooves on the circular saw after the box is put together, but take care to miss the nails.

The legs are 14" lengths of ¼" rod, with 4" of each end bent to 60°. Drill holes for No. 4 wood screws at the center and in each bent end. Paint legs and liner the same color.

CERAMIC-TILE LAMP

ONE or two 6" ceramic tiles will set the decorative theme for a stunning lamp. Square up an 8" or 9" block of 3" lumber. Rout or chisel a ½" recess in one or both faces for the tile.

Drill a ⅜" hole through for a piece of fixture pipe to hold the socket. Finish the block before cementing the tile in. Bend 2" legs on 10" lengths of ¼" rod to 80°. Attach each of the leg members with three screws.

CEDAR-BLOCK LAMP

SLEEK and simple, this lamp is a one-evening job. The base is a 5″-by-5″ block of cedar 12″ high. Bore lengthwise for the cord, opening the hole at the top to a tight screw fit for a ⅜″ pipe nipple. Finish with linseed oil or wax.

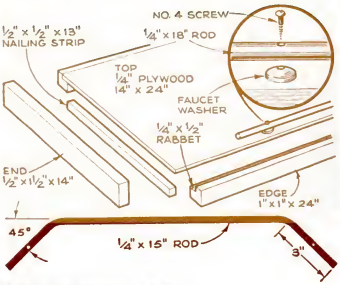
Bend the legs from ¼″ rod as shown in a photo on the next page. Attach with two No. 4 screws apiece. The shade holder shown was made by spot-welding four wires to a washer. You can salvage a like one from an old lamp shade, or use a conventional harp.

THREE-LIGHT CANDELABRA

CANDLES go modern in these updated holders. Saw the long one from 3″ stock 14″ long, making the curve of 14″ radius and 3″ deep. Bore ¾″ holes 1″ deep for the candles. Bend 14″ lengths of ¼″ rod to 120° and attach with small screws, making certain all four feet touch.

Lay out the triangular holder on two-by-six stock, rounding the sides to a 12″ radius as in the drawing. Use a string tacked to a block if you haven't a compass big enough. Legs are 16″ lengths bent 90°. Holder shown is charcoal gray, spattered with yellow.

Please turn the page



TO ATTACH THE LEGS with ample finger space under the handle rails, place the tray upside down on 1" blocks like this. Let the handle part rest on the work surface.

LIGHTWEIGHT TRAY

Roomy and easy to carry, this tray is made of ¼" plywood with a frame around it. Rabbet two edge strips ¼" deep and glue them to the long sides. Glue ½"-square strips under each end. When these have set, glue and screw on the 1½"-wide endpieces. Sand and apply an easily washable finish.

Bend ¼" rod to form feet as shown. Attach these and side rails with No. 4 screws. Put faucet washers under the side rails as spacers.

HOW TO BEND LEGS

Two pieces of ½" pipe make it easy to bend metal rod. For obtuse or right-angle bends, clamp one pipe in a vise as in the left-hand photo. To make acute-angle bends, mark the center of the length of rod. Slip both the pipes on up to, or the same distance from, the mark. Shape with both hands as shown.

Have You Tried a Gun Tacker?

Now a workshop tool of many uses, the desk stapler's big brother is a modern substitute for your hammer.

By Jerry Parker

USING a builder's stapler, you can drive 10 staples in the time it takes to hammer one nail. This is the big reason why so many homeowners are turning to staplers, better known as gun tackers.

You need no skill to get professional results in any of the many jobs a tacker will do—installing insulation, making screens, and applying building paper, roofing felt and upholstery, to mention just a few.

The gun tacker's little brother, the common desk stapler, is also filling in at an increasing number of how-to jobs. If the hep handy man has a gun tacker in his toolbox, he's likely to have a small stapler in his second arsenal, the kitchen

Look what you can do with a tacker

MAKE A SANDER. Wrap a sheet of abrasive paper around a wood block; staple it in place.

ANCHOR CARPETS, especially ones that slip. Also rug pads, stair treads, loose linoleum.

INSTALL FAKE GLASS. Stapling is easiest way of fastening plastic used as glass substitute.

FASTEN RADIO GRILLE. A tacker can expedite countless jobs like this in the home and shop.

UPHOLSTER FURNITURE. Turn over a cushion like this: results will look professional.

TACK WEATHER STRIP. This makes it unnecessary to struggle with a hammer and tacks.

BUILD FENCES. Poultry raisers have found it's easier to fasten chicken wire using a tacker.

MAKE WINDOW SCREENS. A new louvered aluminum screening is being tacked to frame.

REPAIR FURNITURE. It's no trouble at all to staple new canvas covers on outdoor furniture.

Ceiling tiles go up faster, and usually at less cost, with a tacker than with clips or mastic.

drawer, where his wife will find it mighty handy, too.

Most versatile of the little staplers is any model that may be unslung from its base and used as a light tacker. The little stapler can do such things as make paper or cardboard toys and decorations, repair window shades, fasten flower arrangements, attach shoe bags to closet doors and fasten material in place on valance frames.

It Works Like a Semiautomatic Rifle

Using a gun tacker is no more complicated than manipulating a little stapler. The tacker is operated with a squeeze of the fist. A powerful spring, tightened and released as the trigger is bent toward the handle, propels a plunger knife. The knife drives the staples. You can shoot staples as fast as you can pull the trigger.

Each model takes several different staple sizes. The staples, averaging around five cents a hundred, are made of heavy wire and are in the traditional U shape, with a ½″ crown on most types. Staple legs vary in length from ¼″ to 9/16″.

Staples are cemented together in long

SWUNG LIKE A HAMMER, a stapling hammer is the big member of the stapler family. It will do almost all the jobs of a gun tacker and is easier to use in some instances. It automatically drives a ¾″ staple with every whack.

strips and are loaded in strips. Staple legs toe in or out as they enter any material to give a better hold. Rosin-coated staples, which have double holding power, are available, as are galvanized staples.

It takes longer staples, of course, to hold up ceiling tiles than it does to fasten insulation. Staples 9/16″ long and rosin-coated are recommended for tiles, while ¼″ staples are suitable for almost any insulation.

How to Pick the Right Staples

Screening and building paper may also be held with ½″ staples. One staple manufacturer offers this rule of thumb: measure the thickness of the material to be fastened and allow approximately 3/16″ for penetrating the wood or other surface.

Big brother of the gun tacker is the stapling hammer, or hammer tacker. This tool, which looks something like a hammer and is swung like one, delivers a ¾″ staple, the biggest used outside of industry. Shingles held by staples are tighter than those held by roofing nails and they will not come off even in a hurricane.

A small stapler-tacker suitable for household jobs costs around $3. A gun tacker capable of driving staples up to ⅜″ may be bought for $10. If you need a trial to be convinced of their worth, tackers are available for rental from many neighborhood hardware dealers or lumberyards. END

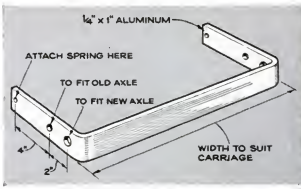
Here are extra uses for a desk stapler

RAINY-DAY TOYS. A stapler has saved many a rainy day by creating novelties, like this hat, for the kids.

SHELF-PAPER ANCHOR. A stapler does the job quickly, neatly, securely.

WINDOW-SHADE TACKER. Use it also to mend torn Venetian-blind tapes.

Youngster Enjoys a Smooth Ride in Knee-Action Stroller



Uneven flagstone walks no longer jiggle the daylights out of our baby daughter when she goes out in the stroller. It now has balloon tires, larger wheels and a knee-action type of spring suspension, all of which I added.

The wheels and tires, about 8″ in diameter, were obtained by mail order. A 60″ length of ¼″-by-1″ aluminum bar, ½″ steel rod to make an axle for the wheels, four tension springs with a 15-lb. pull, washers and cotter pins came from the local hardware store.

The old small wheels were removed and the axles hacksawed off to leave a stub extending about ¾″ beyond the frame on each side. With a hole drilled near the end for cotter pins, these stubs serve as pivots for a new axle-mounting bar shaped from the aluminum strip.

Springs run from the ends of the two axle bars to convenient spots on the stroller frame. The springs were selected and positioned so that the axle-mounting bars are almost horizontal under load.—*Leo H. Kanerva, New Rochelle, N.Y.*

Limit String Will Keep Drawer from Spilling Its Contents

Small drawers that slip out too far and spill their contents can be tethered this way. Fasten a string or tape to the inside of the drawer back and tack the other end to the frame a little more than halfway back. Adjust the length so that it just lets the drawer open fully without falling out. If the drawer isn't low enough to clear the tack head inside, cut a small notch in the back.—*Walter E. Burton, Akron, Ohio.*

How to Put Your Home on a Christmas Card

1 TAPE TRACING PAPER over the photo so that it cannot move. With a pencil, outline the main masses such as trees, houses, fences, roadways and so forth. Pencil in such features as door and window panels, but don't worry about any smaller details. The kit, shown at top of this page, includes everything you need except the photo of your house.

Using a new block-printing kit, you'll find it easy to reproduce a sketch traced from a photo.

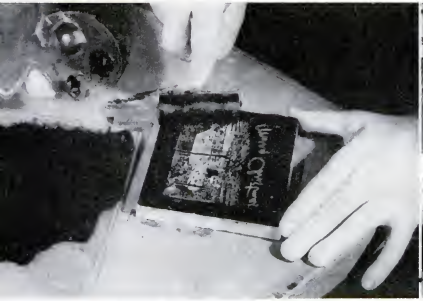
JUST picture your house on this year's Christmas cards. Look good to you? You can do it with a new method of block printing. From a photo of the house you can trace a block to print Christmas cards, book plates, announcements or invitations by the dozen. Of course, other pictures can be used, too.

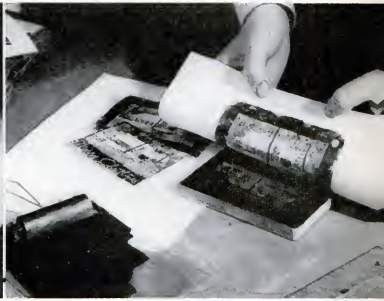
No artistic talent is necessary. By following the steps shown, you will get a rendering similar to an etching. All the materials can be bought as a kit from local art and department stores or from the makers, Bassons Industries Corp., 1432 West Farms Rd., New York 60, N.Y.

2 TURN TRACING OVER and tape upside down to plastic-coated block. Slip carbon paper between. Go over back of lines to transfer reversed tracing to the block. If lines can't be seen, lay tracing face up on black side of carbon and trace over, transferring them to the back. Retrace on block with back side up.

3 OUTLINE MASSES by scratching around them. Scratches will print white; the deeper the scratch, the wider the white line. For solid black, leave surface untouched. Crosshatching or parallel lines give gray tones. Refer to photo often, but don't try to add every detail. Blow off dust from the block as you work.

Trim prints with a narrow black margin all around and paste them on card stock or folders.





4 **NAME OR GREETING** must be written mirror-backwards on block. Write it on paper laid on face-up carbon. Flip paper over to trace reversed writing on block, and scratch it out. Dab ink on plastic sheet provided. Spread with roller; then run inked roller over the block, depositing an even coat of ink.

5 **DROP PRINTING PAPER** straight down on inked block so that it does not slide and smudge. Rub back of paper firmly all over with heel of hand or wad of soft cloth until image appears faintly. Peel off with two hands as above. Re-ink block with roller for each print. Let prints dry an hour before stacking.

BEVEL CUTS are as simple as straight ones with this new saber-saw attachment. The tilt-arbor control swings the saber blade to the desired angle. Big work is easy to handle because the table provides generous support.

Jigsaw Attachment Cuts Curves on Circular Saw

Saber blades let you use the full table, with no arm to restrict swing of big work.

IN MINUTES, an unusual accessory converts a popular 8″ tilting-arbor saw into a husky saber saw. Taking over where the round blade leaves off, it will cut flowing contours or intricate curves in stock up to 2¾″ thick. With sanding strips or files in the saw chuck, it will smooth and finish wood or metal.

The fence and miter gauge being removed, the entire saw table is available to support large pieces. Since the stiff blade requires no backing above the table, there is no over-arm, and work of any size can be swung completely around. For inside cuts a hole is drilled and the work simply dropped over the blade.

Mounted on the heavy round bars that form the tilting-arbor and motor-support frame, the attachment tilts just like the regular blade, the same tilt-adjustment knob being used. Precise bevel cuts are therefore possible.

Running in bronze bushings, the shaft is fitted with a 5″ pulley that reduces motor speed to about 1,500 strokes a minute. The reciprocating mechanism runs in an oil bath. With two saber blades, wrench, extra blade support and a special table insert, the attachment is priced at about $15. It is made by the Rockwell Mfg. Co., 436 N. Lexington Ave., Pittsburgh 8, and it will fit any 8″ Delta tilting-arbor saw, old or new.

ARBOR IS TILTED for installation of the unit, which takes only a few minutes. The box-like housing fits under two horizontal shafts that comprise the tilt-arbor frame. Two small rectangular bars are then slipped into slots in the housing, above the frame shafts, and are clamped against these with screws.

CIRCULAR SAW BLADE is removed. The belt is run on the arbor pulley and along the top of the pulley on the saber-saw attachment to drive it. Finger-locking vise-type chuck holds blade by its lower end only. A slotted bracket supports blade below the table. Chuck will also hold sanding and filing tools.

9 USES FOR Hub Caps

CHARCOAL GRILL

SELF-RIGHTING SIGN
FILL BASE WITH LEAD OR OTHER HEAVY MATERIAL

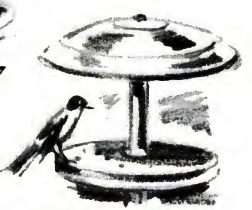
HANGING BOWL
FOR FLOWERPOTS

FLOOR STANDS
FOR PHOTOGRAPHER'S LAMPS, HEALTH LAMPS, WORK LIGHTS, ETC.

CLOCK FACE

INDIRECT LIGHTING FIXTURE

KING-SIZE ASH TRAY

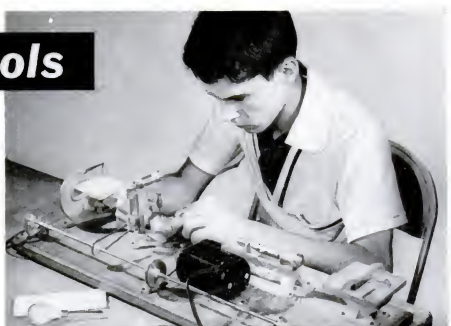


ROOF FOR OUTDOOR BIRD FEEDER

PLANT BOWL

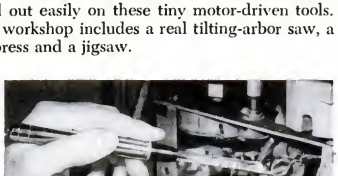
New Tools

1. Plate Guides Plane. A pivoted plate that can be clamped to the side of an ordinary plane keeps the blade at any desired angle to the face of the work. By guiding against the plate, jointing, squaring and beveling can be done more accurately.

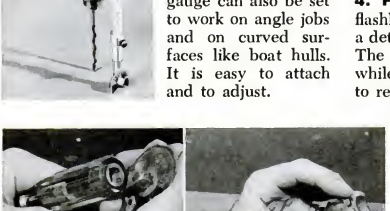


2. Tiny Power Tools Do Everything. Parts for models can be turned out easily on these tiny motor-driven tools. The table-top workshop includes a real tilting-arbor saw, a lathe, a drill press and a jigsaw.

3. Gauge Aligns Drill. Clamped to an electric drill, this device helps hold the bit square to the work. When three points on the foot all bear on the surface, the drill is straight. Drilling depth is read on the graduated shaft. The gauge can also be set to work on angle jobs and on curved surfaces like boat hulls. It is easy to attach and to adjust.



4. Probe Spotlights Work. Useful as a flashlight by itself, this inspection light has a detachable plastic probe and angle mirror. The probe pipes illumination to its tip, while the magnifying mirror turns corners to reflect hidden areas.



5. Handle Is a Ratchet. This knob-shaped ratchet head snaps onto 40 different tools, including various kinds of screwdrivers and socket adapters. Its large grip gives extra torque with less effort than conventional handles, and the knob can be reversed to operate in either direction with a flick of your finger.

Further information about the tools shown on this page can be obtained from: 1. Perrine Co., Harrison, N.J.; 2. Dynamic Devices, Inc., 125 Sunrise Pl., Dayton, Ohio; 3. High Standard Mfg. Corp., Hamden, Conn.; 4. Moore Mfg. Co., Swedesboro, N. J.; 5. Kipton Industries, Inc., Kipton, Ohio.

New Hardware Speeds Furniture Building

These tricky gadgets and prefab parts let you make fancy pieces without fancy price tags. Equipment needed: just a screwdriver.

By Sheldon M. Gallager

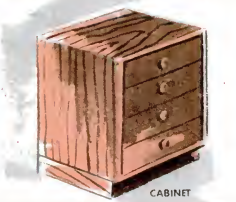
EVER looked longingly at some gleaming wrought-iron furniture piece and wished: "If I could only weld"? Or eyed some fancy revolving-kitchen shelf and thought: "I could build that easily if I just had the little special piece of hardware that makes it go around"?

Now you can do these things yourself, and many more. New furniture-building hardware and prefab parts let you create eye-catching effects formerly found only in costly custom jobs.

Putting the parts together yourself means you get exactly what you want. You don't have to shop around for a bookcase to fit a particular spot—you make it to fit. Using identical parts, you can combine them into any type of furniture you want. A board with legs makes a table—a whole room divider can be just a lot of tables stacked on top of each other.

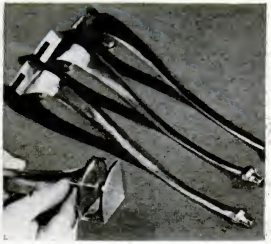
On this and the following four pages you'll find many tricky, where-do-you-ever-find-them gadgets that make furniture building a dream job instead of a drudge.

BOARD IS BASIC part of modern furniture. You give it legs, it's a table; brackets, it's a shelf; sides, it's a cabinet. Adding fancy hardware to plain boards is what makes furniture building fun for the home workshopper.

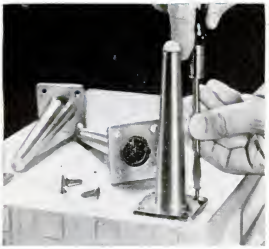


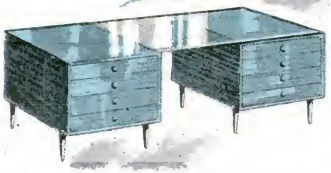
Here are four ways to put legs on furniture quickly

HARDWOOD LEGS take only seconds to put on or take off. A wood block containing a threaded metal socket is screwed to the underside; then a stud in the top of the leg is screwed into the socket. Available from Country Workshop, 95 Rome St., Newark, N. J., they come in six lengths from 6″ to 29″, and with blocks for vertical or flared mounting.



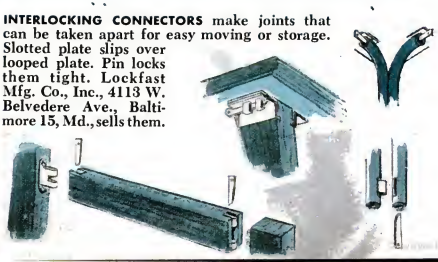
FANCY TABLES made of glass, marble and other hard-to-mount materials are easy with these clamp-on metal legs. You simply tighten a single setscrew at each corner, without drilling or marring the table top. Sold by Simon's Hardware, Inc., 421 3rd Ave., NYC, the metal legs come in several lengths and in two different styles for either square or round tables.



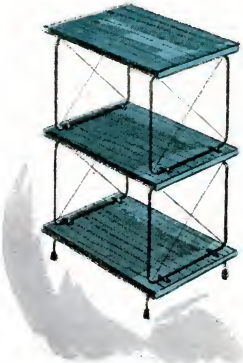


STUBBY BRASS LEGS have a rich, solid look, are made especially for modern sofas, radio consoles and other furniture that needs short, sturdy legs. Also available from Simon's (see above), they come in several lengths.

INTERLOCKING CONNECTORS make joints that can be taken apart for easy moving or storage. Slotted plate slips over looped plate. Pin locks them tight. Lockfast Mfg. Co., Inc., 4113 W. Belvedere Ave., Baltimore 15, Md., sells them.

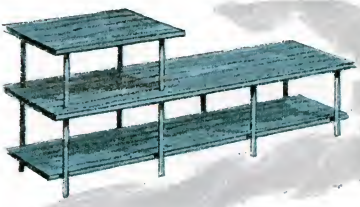


Stacked units build many shapes and sizes



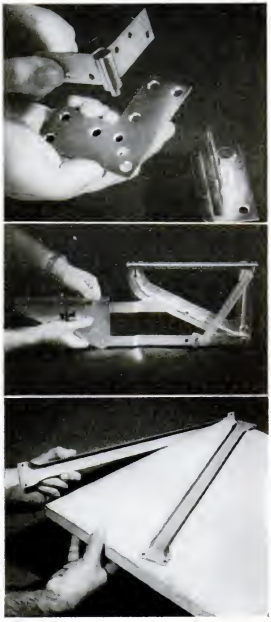
WROUGHT-IRON LEGS AND SPACERS will build anything from a single bookshelf to an entire storage wall just by the way you arrange them. Spacers are 8" wide by 11" high, legs 2⅜" high. Sold by Anchor Sales Corp., 350 37th St., Brooklyn, N. Y., they're simply screwed to one-by-ten or two-by-ten planks to make completed units requiring only finishing.

SHELVES AND TABLES of any size are easy with these hardwood dowels, since you cut the boards first, then just attach the dowels at the edges to space them apart. Three lengths of dowels—3½", 10" and 13"—permit any combination of levels and are pinned together by metal brackets that screw to the boards. Available from John Clark Brown, Inc., 1 Montgomery St., Belleville, N.J., the dowels can also be joined to form straight legs.

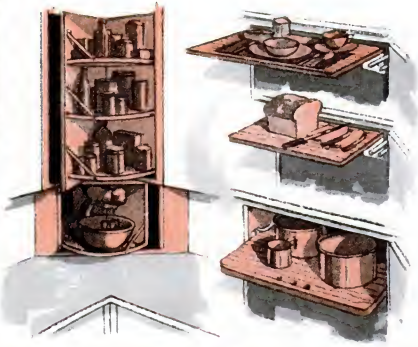


METAL FRAMES can be grouped to make tables or stacked to form stepped shelves and room dividers. All you do is fit squares of ¾" plywood or other material into angle-iron tops. Frames, made by Hodor Furniture and Furniture-in-Parts, McCarter Highway and Raymond Blvd., Newark, N. J., can be stacked easily. *(Please turn the page.)*

Trick shelves spin, slide or disappear



REVOLVING SHELVES for kitchen corner cabinets or other hard-to-reach spots are quickly made with only two of the corner brackets and pivot plates at top left. Brackets, screwed to two vertical boards, hold the boards at right angles and provide top and bottom pivots that fit sockets in the base plates screwed to the cabinet frame. Similar unit (at right in same photo) makes straight-backed shelf. Disappearing shelf brackets (center left) keep everything from a typewriter to a snack bar hidden neatly away, yet spring instantly out for use. Brackets are screwed under existing shelf or counter up to 36" apart. At bottom left, inexpensive metal channels make it easy to mount sliding shelves in deep cabinets so you can pull them out to reach supplies stored in back. Channels are screwed to cabinet sides, and shelves up to ¾" are just slipped in. All shelf hardware shown here is made by Washington Steel Products, Inc., 1940 E. 11th St., Tacoma, Wash.



Swivel makes revolving furniture easy

YOU CAN MAKE YOUR OWN revolving stools, chairs and other furniture with this ball-bearing swivel. You just add a seat or table for the top and four legs, which fit into sockets that hold them at the correct angle. Made by the Reflectone Corp., Stamford, Conn., the swivel will safely support such loads as a revolving TV set or marble coffee-table top.

Plastic drawers dress up simple cabinets

PREFAB DRAWERS, made of gleaming-black molded Bakelite, take the finicky work out of cabinetmaking—all you do is build a simple box around them. The twin sectional units above have four drawers each, are made with detachable toe-recess bases so that as storage needs change they can be stacked to make a tall chest, grouped side by side, or used individually. The plastic drawers, available from the Boonton Molding Co., Boonton, N.J., are 17″ wide, 15″ deep, and 4¾″ high. They are seamless.

FANCY KNOBS, available at hardware stores in a variety of shiny metals, are easily bolted to drawers by drilling a single hole through each front. To guide drawers, all you need are pairs of thin lattice strips tacked inside cabinet and set ⅜″ apart to engage lips on drawer edges. Cabinets here, made of ⅜″ plywood, are 19¾″ high, 17⅞″ wide, and 16″ deep. Drawers are interchangeable.

Hardwood kits make a whole roomful of furniture

WIDE HARDWOOD PANELS come already edge-glued and surfaced in these kits, saving joining and finishing small boards yourself. The panels can be cut as desired or used as they are to make tables, shelves and cabinets without even sawing the parts. Sold by the Shreveport Lumber Sales Co., 1166 Louisiana Ave., Shreveport, La., panels are kiln-dried red gum 25/32″ thick. They come in 12″, 16″ and 22″ widths and in lengths from 12″ to 48″. END

For the best in basketball photos, take a tip from an expert. It pays, he says, to

Shoot from the Basket

By Dave Stanley

IF YOU, as an amateur photographer, want to shoot basketball pictures, come early and grab yourself a seat alongside the basket, or as close as possible. There, most of the action comes right up to you. Trigger finger ready, you wait to capture such shots as spills, fast-breaking lay-ups and the facial expressions of the players.

SPECIALIZING IN SPORTS, noted news cameraman Herbie Sharfman is a fixture at all the top basketball games.

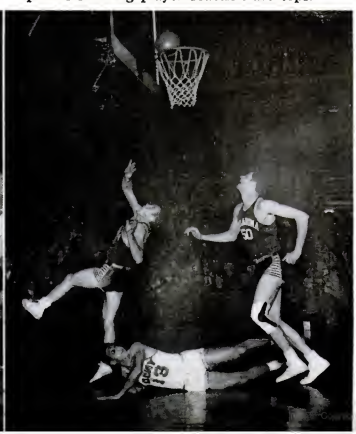
That's how it's done by heavy-set, 42-year-old Herbie Sharfman, ace sports photographer for International News Photos. For the past 14 years he has clicked a procession of sparkling basketball pictures at sweat-stained Madison Square Garden, the 69th Regiment Armory in New York, and West Point. Past his lens have gone the country's fastest dribblers, the trickiest ball handlers and eagle-eyed set-shot artists, from Bob Cousy to point-a-minute Bevo Francis. His sports shots have won several "Oscars" of the photography world: the 1953 New York Press Photographers' Award, the *Look* Award, the *Encyclopaedia Britannica* Award and the University of Missouri Award.

"Choice seats in the first row, within 20 to 25 feet of the basket, are best," Sharfman says.

This is the sneakered Klondike where the players seek pay dirt. Most of the fast action swings in and out of that area. "Preset your camera according to the distance you are from the basket. Follow the ball. Anticipate what's going to happen, like a man breaking away alone. Or a guy ready to go up for a

PLAYER FLYING into the laps of the spectators was shot by Sharfman at the 1949 game between Yale and NYU. Such sideline acrobatics always offer good photo possibilities.

WILL IT GO IN? This stop-action photo caught the players watching anxiously while the ball was poised on the basket rim. Sharfman feels photos showing player reaction are tops.



HIGH IN THE AIR, a Manhattan College player makes like a spread-winged bird. Strobe lighting makes it much easier to get photos like this.

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lay-up shot. Watch for a deliberate foul."

If you're lucky enough to be on the first-row sidelines near the basket, try this trick with "jumpers." Jumpers are the players who break in fast, dribbling, and then leap for the lay-up shot. "You can dramatize this skyward attack," says Sharfman, "if you get a lot of jumpers and get down on the floor and shoot up."

He Finds Gold in the Unexpected

In Sharfman's book, the shots that are pure gold are spills, dives for a loose ball, accidental jumps into the crowds, scrimmages underneath the basket. He pursues these with a hunter's zeal.

Are you sunk if you're stuck far off in the fifteenth row of the grandstand or up in the balcony? Not at all. "You can still shoot and have good results," says Sharfman, "but you change your camera attack. You shoot real slow and freeze slower action. Like a center jump. Here you can catch the leap upward, the player's facial reactions to the jump, the cheer leaders, the crowd action."

You can shoot basketball three ways—by natural light, flash or strobe.

Yes, you read it right. You can shoot with natural light, for many gyms are as well lit as supermarkets.

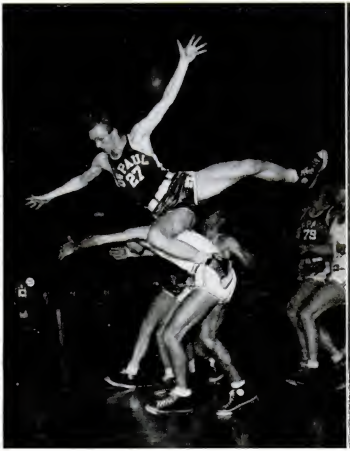
"At Madison Square Garden," says Sharfman, "you can shoot at 1/200 with a good camera at f/2 without flash. And with a good camera, you can even be in the balcony and freeze the action, by shooting slower at 1/50 at f/3.5."

New Film Is Natural for Natural Light

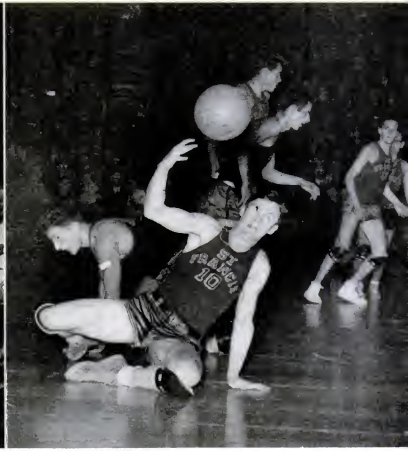
Shooting with natural light has become still a stronger possibility since Sharfman made this statement to me. The Eastman Kodak Company's new Tri-X film, announced only a few weeks ago, is made to order for basketball photography.

Packaged in 35 mm., 620 and 120 roll-film sizes. Tri-X is just about the fastest film available for amateur use. It has an ASA rating of 200 in natural light—twice as fast as Super XX.

Sharfman's specialty is meat-and-po-



NO FLASH IS NEEDED to get excellent basketball shots. Lighting in gyms nowadays is often so good that you can snapshoot. But camera lights are still best for shots like this.



FLOOR ACTION is often more dramatic than action showing players on their feet. Supporting himself on one hand, this St. Francis player uses the other to pass the ball to a teammate.

LEAPFROG INTERLUDE is Sharfman's title for this picture, which won a New York Press Photographers' award. When one player stooped, others behind leapfrogged over, one by one.

tatoes action, the faster the better. But he can touch subtler emotions, too. One of the most dramatic things he has snapped is "expectation." As Sharfman puts it, "A player shoots. The ball goes up and rolls around the rim. All the players look up in a variety of expressions. There's drama in that picture."

Sports World Is His Beat

Born in Chicago and raised in an orphanage, Sharfman broke into sports photography via the back seat of a motorcycle. From an International News Photo motorcycle messenger, Sharfman got into the photo lab, and then into general news photography. Today, he's the sports specialist for this tremendous photo syndicate, covering championship fights, the World Series and the top basketball games. He lives in Brooklyn, N. Y., with his wife and two daughters, Lenore and Rebecca. If you're a fight fan, you may remember his brother, Sammy Sharfman, who was a pretty good middleweight boxer in the Thirties.

Don't think of basketball strictly as an indoor proposition, Sharfman counsels. "In the past 20 years, basketball has gone outdoors. Today, you can shoot a lot of pickup teams and weekend athletes at the local playgrounds. And there's some wonderful stuff to shoot."

In almost any neighborhood you'll find men in Army pants and T shirts playing basketball with one eye on the basket and the other on the baby carriage.

"Those outdoor basketball games are a wonderful place for camera fans to practice before attempting to shoot a real game," says Sharfman.

"In shooting outdoor basketball action, stick to the principles of outdoor sports photography: adequate sunlight, proper shutter speed, fast film." END

Drill Cleans Paint Roller

After working as much paint out of a roller as you can by rolling it over newspapers, spin it clean with your electric drill. Make an arbor for the sleeve from a piece of heavy dowel or clothes pole and drive a ¼" wood screw into one end. Cut the head off the screw and chuck it in the drill. Force the roller sleeve over the arbor and dunk it in thinner.

Shove the roller and the drill into an empty pasteboard carton and pull the trigger. Repeat the operation if necessary.—*L. M. LaBar, West Pittston, Pa.*

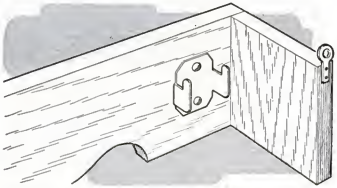
Homeowner Plans for Additions

If your bankbook is not as expansive as the dreams of your new home, plan the whole house anyway, as John Morgan of Holbrook, Mass., did. He envisioned a garage and connecting breezeway on one side of his house, to be added later. With this in mind, Morgan had the builder install the end timbers on the wall of the house before shingling it. Now, when the time comes to build the breezeway, the job will be a breeze. He can begin his framing without removing any of the shingles.

Tangleproofing a Bell Rope

When church, school or fire bells are rung with too much enthusiasm, the bell often flips over, tangling the rope around the bell crank and supports, making it necessary to climb the tower to free the rope.

Make a free-turning rope eye by screwing an eyebolt into a hole drilled and tapped in the tread of a roller-skate wheel. Weld the eyebolt to keep it from unscrewing itself and mount it on the bell crank with a bolt and short spacer to hold it clear. —*Ronald L. Ives, Williamsville, N.Y.*



Make a Cornice . . . the Easy Way

Using only a hammer and saw, you can turn out good-looking cornices. Here's how my husband did it in an afternoon:

Measuring the width of the windows, outside the casings, he added 6" to the length needed so the cornice would extend 3" on each side. To this he added another foot to allow for two side pieces, each 6" long. This gave him the total length of 6"-wide pine needed for each window.

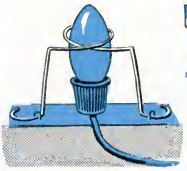
After sawing off the two endpieces, he fastened them to the front with glue and small nails. He pounded an L hook into the wall on each side and screwed eye hangers on the cornice ends. We used our old drapery fixtures in each end of the cornice and hung the rods on them.—*Ann Friday, Medway, Ohio.*

KEEPING THE Home SHIPSHAPE

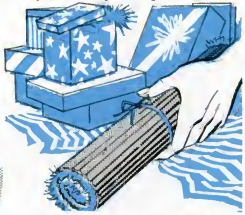
MAKE A WINDOW TREE of wood strips. Illuminate it with a string of lights tacked to trunk and limbs on the room side and form red paper cylinders for candles.

A GIANT RUBBER BAND cut from an old inner tube and snapped over the top of the stepladder eliminates scrambling after dropped tools.

AN ELECTRIC-BLANKET CONTROL fastened to the bed with a U bracket bent from aluminum is safe and handy. Dangling wires can be tucked away from mops and passing feet.



BULBS WON'T DISAPPEAR from an outdoor tree or from door and window decorations if they are locked in place with bent wire fastened at the ends with staples.



WHEN YOU OPEN PACKAGES, roll up any excelsior in corrugated paper and tie it up in discarded gift wrappings. It makes fine kindling and is easy to store and handle in compact rolls.

Please turn the page for more home tips

More Home Tips

NO FIRESIDE TOOLS? A toy broom and a stove shovel with insert to lengthen handle will keep a fireplace neat.

RED ROSIN PAPER, used by builders, is ideal for protecting floors and rugs when you wash or paint walls.

BALLS OF ICE to float in a punch bowl can be made by partly filling balloons with water, freezing them, then cutting the rubber away.

PEG 'EM UP and soaked overshoes will dry faster. Stick broom ends in a board for use at back or side door.

FOR A WHITE CHRISTMAS, frost your tree with white water-base paint thinned to the consistency of liquid shoe polish. Spray outdoors so there's no cleaning-up chore.

FOR GLITTER, crush broken Christmas-tree balls in a bag-covered pan. Dust the flakes on gift packages over swirls of rubber cement.

3 Men and a Ship Kit

By Henry B. Comstock

MONSTROSITY, pretty toy, or museum piece—the choice is yours when you assemble a ship-model kit. The carefully detailed Mediterranean merchantman shown here had its start in the box at the right. But it could easily have been a lot less handsome.

If you are a ship-kit modeler, check your construction methods with those of your fellow hobbyists on the three following pages. Are you a "Kit Carson," a "Literal Lyman," or a "Super-Scale Smith"?

KIT CARSON is a balsa-wood beaver. Each year he chops up enough Peruvian softwood to float an armored division. Kit is the boy who can turn a $1.50 ship kit into five cents' worth of mantelpiece flotsam faster than you can say "deflation." His methods, based on no trial but plenty of error, are unbelievably simple. Kit times his projects with a cuckoo clock.

1. "SCRAMBLE ALL PARTS thoroughly before you sharpen your hatchet," says Kit. "Some of them are bound to fall together. Next, throw away the plans. That way, your model will have a custom-made look."

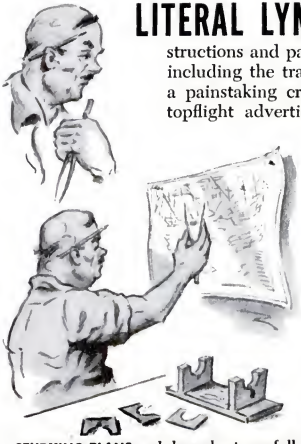
2. KIT FIGURES his sharp eyes are worth a dozen rulers, squares and calipers. What if some of his masts cant a bit to port and starboard? He can always spring them back in line with a 90-pound tug on the shrouds.

3. "RUN UP YOUR COLORS before you finish shaping the hull," Kit counsels. "Then slap on the anchor, dinghy and poop lamp. Little tricks like that helped the Kaiser shipyards set production records 10 years ago."

4. KIT HAS A KNACK for rigging. He starts with the mainmast. This traps him in a nylon spiderweb, making access to the fore- and mizzen-masts impossible. But why worry? Thick and husky, they need no staying.

5. OOPS! The brittle balsa snaps when Kit tries to bend the skids. "Forget 'em," he says. "They'd be buried under the paint job, anyway." A splash of high-gloss enamel and Kit's one-evening project is complete.

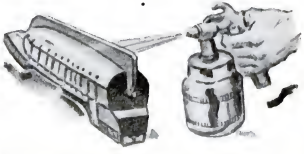
LITERAL LYMAN couldn't build a model of a surfboard without a full set of blueprints, instructions and packaged parts. He reads everything five times, including the trademark and manufacturer's address. But he's a painstaking craftsman and every kit he puts together is a topflight advertisement for its manufacturer.



1. STUDYING PLANS and dope-sheet carefully, Lyman sets up an orderly work pattern. To help him shape a symmetrical hull and align deck fittings and rigging correctly, he uses templates and a temporary wood base.

2. UNLIKE KIT CARSON, Lyman has no trouble bending balsa skids. Before applying each strip, he cuts notches at intervals along its inside surface, then soaks the wood in a basin of hot water to make it pliant.

3. PLANKING, printed on balsa deck lifts, disappears when Lyman sands down porous wood. Lyman knows better than to try scribing planks on balsa. Instead, he covers the lifts with neatly scribed Bristol board.

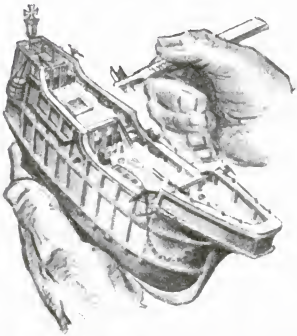


4. LYMAN shellacs the finished hull, then sprays large color areas with lacquer. He sands each coat, cuts down gloss with final spray of clear, flat lacquer. Details are added with a brush, using oil colors.

5. MASTS AND SPARS get a coat of orange shellac before Lyman attaches them to the fully painted hull. Last step is the rigging, which starts with the foremast. His "Santa Maria" is handsome but somewhat toylike.

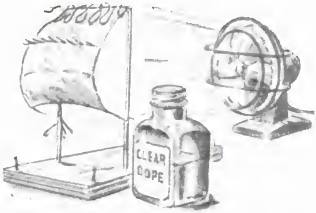
SUPER-SCALE SMITH is a bearcat for realism. Down at the local public library, Super-Scale learns that his "Santa Maria" kit plans are actually based on a seventeenth-century merchantman. Content to call his model that, he makes sketches of hull, armament, and rigging features not included in the drawings that came with the kit. Smith even makes a study of period costumes, for his model will be sailed by ½-inch figures, appropriately attired.

1. POT-METAL STERN LANTERN supplied with the kit doesn't measure up to Smith's standards so he turns another from white pine. Rudder chain and aftercastle windows add authentic flavor to the towering transom.



2. LADDER CASTINGS are off-scale so Smith builds his own. He reinforces the gunwales with inboard bracing and shapes a second anchor—only one came with the kit. "Smithsonian" touch is whipstaff to throw tiller.

3. BLACK BEADS supplied with kit don't look enough like deadeyes to suit Smith. He buys accurate scale reproductions (at 35 cents a dozen), and then carefully threads them in a fiber jig to insure correct spacing.



4. NYLON SAILS are an anachronism, but they look like the real thing. Soaked in clear airplane dope, the cloth is stretched loosely over wire frames and billowed out with the blast from an electric fan.

5. SMITH GOES OVERBOARD on a flossy base for his model. White-pine carving of a mermaid is mounted at the center of a stylized compass, where it rotates once a minute, turned by an electric clock motor.

The Saw You Can Build into a Workbench

Bench plans are yours for the asking, and the new radial-arm unit lifts out for use elsewhere.

By Herb Pfister

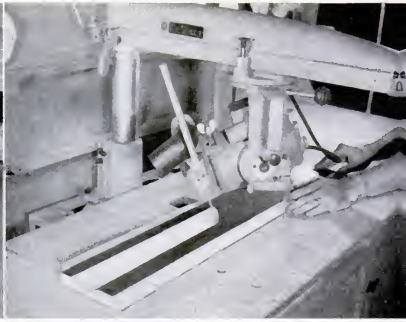
THE three-dimensional movement of a radial-arm saw makes it an easy tool to handle. The work lies still on a table while you pass the saw over it from almost any direction in an accurately guided path. DeWalt has just announced a new radial-arm saw for home-shop use. It's a handy-man-size duplicate of their larger industrial saws and can handle a wide variety of cuts. You can use the saw to build its own bench. DeWalt, Inc., P.O. Box 540, Lancaster, Pa., will send you blueprints free upon request.

Please turn the page for more radial-arm saw tricks

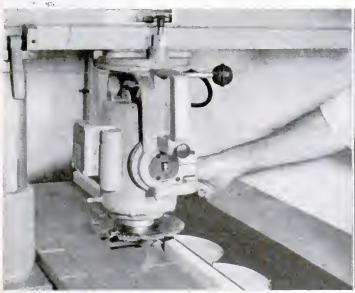
TRICK CUTS like this saucer cut come naturally to a saw that can move in three planes (height, swing and tilt). Here wood is scooped out by tilting blade.

Trick Cuts with a Radial-Arm Saw

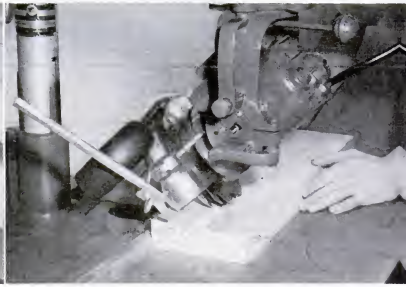
SHADOW-BOX CUT. Compound angle is made in one swing. Arm is set over to 30° right-hand miter and blade tilted to 35°. Stock is held against fence.



CONTOUR CUTTING. Tilt and swivel the motor to set blade on diagonal to plow out desired contour. Stock is pushed along fence beneath 9" blade.



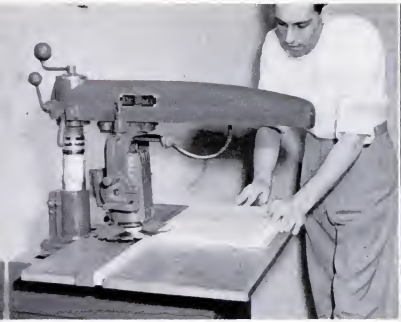
SCALLOPS, useful for valances or decorative moldings, are cut with dado head. Dado is locked at desired height and work is pushed into it until it touches fence.



V CUTS can be made to any depth in one pass by building up the dado thickness and setting it at a 45° angle. The work is pushed underneath the motor.

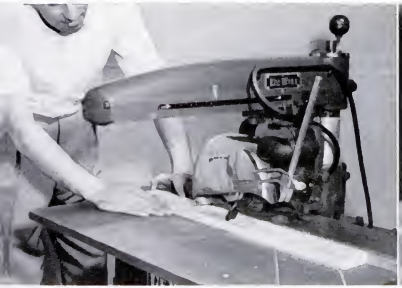
SABER-SAW ATTACHMENT mounts on motor in place of the saw guard. The blade works in a hole drilled in the saw table.

BORING. Special bits designed for counter-clockwise rotation of the motor make the radial- arm saw into an accurate boring machine. Scale on arm spaces holes evenly.



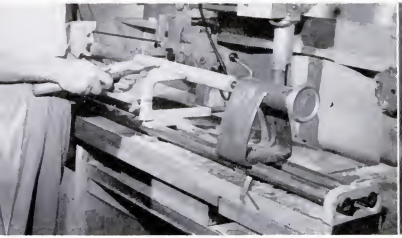
RAISED PANELS come out even on all four edges because cuts are made with board moving flat on table. The blade is tilted upward 5 or 10°.

DIAMOND SHAPES, cut from triangular strip of wood, can be assembled into attractive three-dimensional wall plaque. Pieces are in foreground on table.



MOLDINGS can be made with two-point molding cutters which come in a variety of shapes. The guard almost covers the cutter and throws chips out to side.

SHAPING is done with a three-blade cutter head. Above, irregular piece follows plywood disk tacked to table. The work is pushed along the fence for straight shaping.

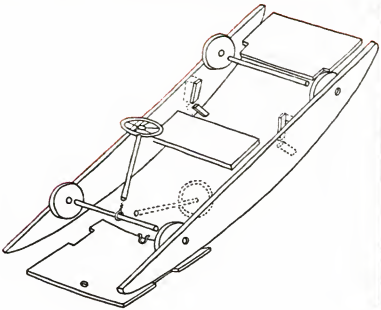


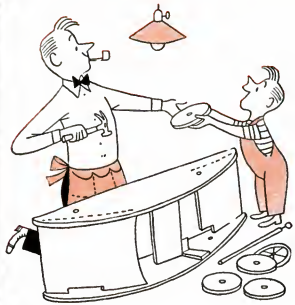
WOOD-TURNING LATHE has 12" swing. It clamps on the saw table and gets power through a V belt running to a pulley on the motor.

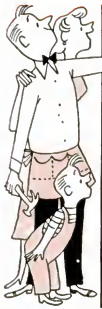
SANDING can be done with the drum sander shown or disk sander which also acts as surfacer. Attachments are available for grinding, buffing and routing. END

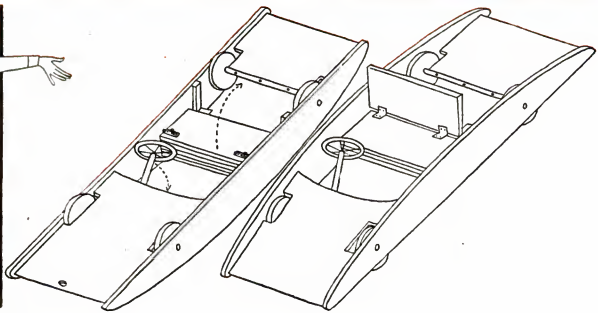
By Roy Doty and Warrant Pryor

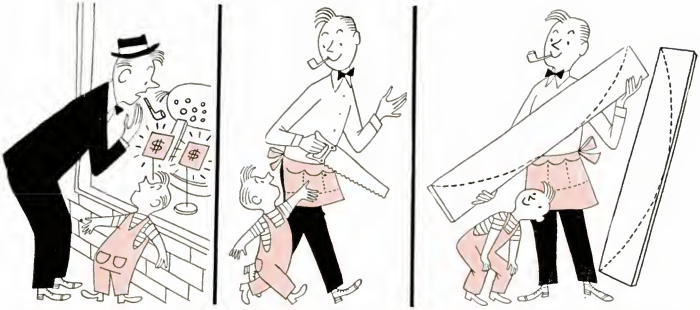
Wordless Workshop

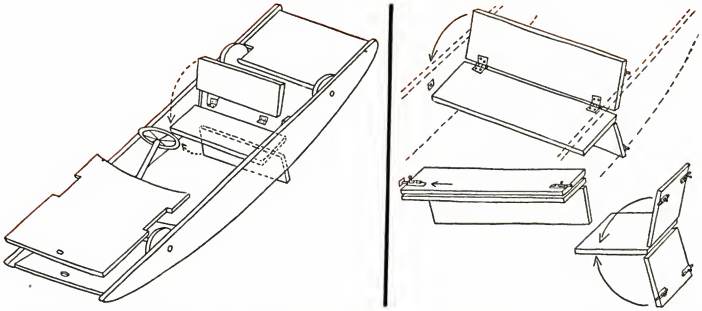


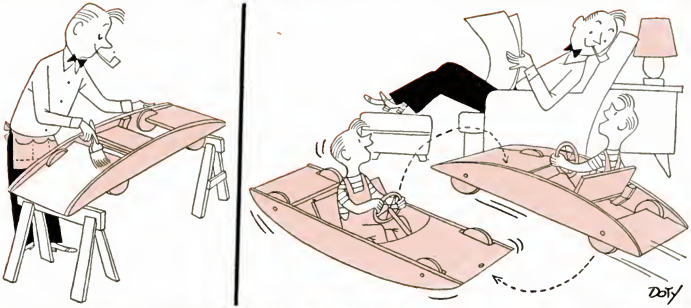












Next Month: Hitching a slide to a bunk bed gets Junior out fast

Our Table Top Is Parquet Flooring

Resembling handsome inlay work, the wood blocks come with a durable factory finish.

By Leslie E. Bailey

WHEN my wife and I first saw samples of modern parquet flooring, our immediate reaction was, "Do people *walk* on this handsome stuff?"

We had only recently bought our home. One of the things we still planned to buy, or perhaps make, was a long, low coffee table. On seeing the flooring,* we both had the same inspiration—use it.

We did. And here's the result, a 22"-by-50" table built for less than $20. The parquetry gives the top the appearance of fine inlay work.

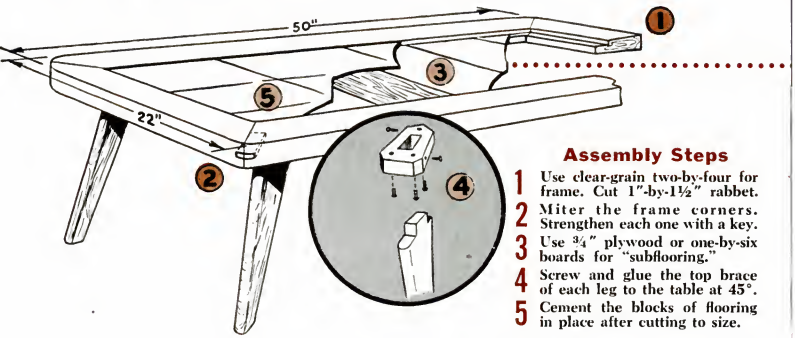
The factory-applied finish on the blocks provides a rugged top, highly resistant to the bumps and spills most tables encounter. The blocks are flexibly joined so you can split them easily into smaller pieces than the 12"-square piece normally supplied. Best of all, the top can be put into place with nothing more complicated than cement.

Making the frame. A simple frame makes the body of the table, and holds a plank (or plywood) "subfloor" on which the flooring blocks are laid. Select a piece of straight, clear-grained fir two-by-four. Cut corner miters carefully, in order to insure a tight fit when the frame is glued up.

Cut a rabbet on the inside edges of the frame pieces to take the subflooring and top. Use either ¾" plywood or one-by-six planks for this. The rabbet in the frame should be as deep as the thickness of the subfloor plus the floor blocks. These are usually ½" to ⅝" thick.

You can strengthen the frame and get a more accurate joint by adding a key at the corners. Edge-cut a slot across the mitered corners to take a ⅜"-by-1" strip, a job which you can do easily and accurately with a dado cutter on a circular saw. Any part of the key extending into the inside rabbet can be chiseled away after assembly.

Gluing the miters. A gluing jig makes an easy way to assemble the frame. Nail a pair of cleats on a board to hold the ends in position. If you do not have cabinetmaker's clamps, a piece of rope twisted with a stick will pull the miters together until the glue sets. The wood-



Assembly Steps

1. Use clear-grain two-by-four for frame. Cut 1"-by-1½" rabbet.
2. Miter the frame corners. Strengthen each one with a key.
3. Use ¾" plywood or one-by-six boards for "subflooring."
4. Screw and glue the top brace of each leg to the table at 45°.
5. Cement the blocks of flooring in place after cutting to size.

**The flooring blocks we used were made by Parkay, Inc., Louisville 9, Ky.*

All of our friends wonder how we ever accomplished what looks just like an intricate inlay.

en keys at the corners are a big help in lining up the joint and pulling it up tight.

After rounding off the corners and sanding the frame, the subflooring is laid into the rabbet. Glue and screws will hold it tightly.

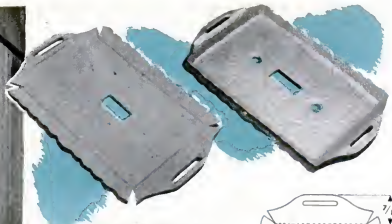
Attaching the legs. Each leg assembly is made in two parts, the leg and a brace which attaches to the underside of the table. Lay a leg out full size on paper for accurate tapers and angles at top and bottom. Round off the leg edges with plane or spoke shave after cutting.

The leg brace is made of the same material as the leg, either oak or maple flooring strips. Fit one end of the brace into the corner of the frame. Cut a mortise in the brace the width of the leg and 1½" long. Cut the leg end to fit this mortise snugly.

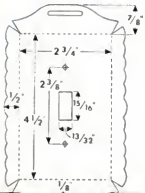
Drive screws through the brace into the leg from opposite sides after gluing the joint. Before the leg is assembled, holes should be drilled for attaching the leg to the bottom of the table. Line the leg assembly up on a line drawn from the mitered corner, and attach the legs with glue and screws.

Begin finishing the table with a penetrating oil stain to blend the dissimilar woods used in the table, and apply a varnish or lacquer finish. Rub the finish down carefully, and your table is now ready for its inlaid top.

Parquet goes in last. This is the easiest part of the project. Use a linoleum trowel to spread the cement evenly and with fine ridges on the subflooring. Then simply lay the parquet blocks in the cement, and your modern coffee table is finished. END



MAKE CARDBOARD PATTERN (above) to be sure that corners fit neatly and toggle opening lines up with screw holes. Then lay pattern on 1/16" aluminum sheet and trace around it with scriber. To cut handle slots, drill 1/8" holes and saw out waste between.



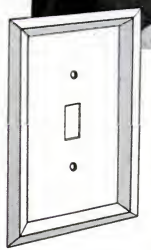
Aluminum Designs Will Dress Up Your Light Switches

HERE'S an easy way to liven up plain-looking light switches and help keep them clean to boot. These decorative wall plates, snipped from aluminum sheet, not only add a novel touch to any room, but their projecting edges channel smudgy fingers toward the switch itself, keeping them off the wall. They're also a helpful guide in the dark.

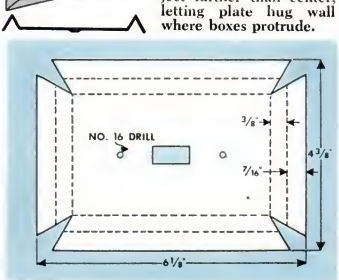
The miniature serving tray spells food on the way in the kitchen or dining areas. The plainer picture-frame type fits nicely in other spots. For a hammered finish, as shown on the tray, tap all over with a ball-peen hammer.

The patterns shown are for single-toggle switches. For multiple types or outlet boxes, use the existing plates as guides for cutting the openings.—*Walter E. Burton, Akron, Ohio.*

CUT OUT ALUMINUM with jeweler's saw, as above, or fine-tooth coping saw. Drill starting hole for toggle opening. Bend up sides, solder corners, and file edges smooth.



PICTURE-FRAME PLATE (at left and below) has simple lines that suit any room. Outer edges project farther than center, letting plate hug wall where boxes protrude.



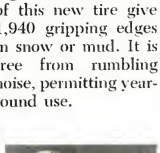
1. Door Opens Electrically. Easily installed on the ceiling of any garage having an overhead door, this radio-controlled unit lets you open the door from the car. A button on the dash sends out an individually tuned impulse to the receiver in the garage to unlock the door, open it and turn on the light. After you drive in, the unit closes and locks the door and turns out the light. A safety clutch stops the door if it should hit against an obstacle. Lumber and building-supply dealers stock and install the unit.

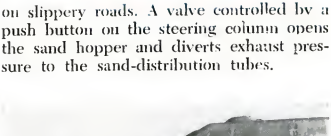
New for Your Car

2. Exhaust Blows Sand Under Wheels. This road sander utilizes the power in your car's exhaust to blow sand back under the rear wheels where it can provide traction on slippery roads. A valve controlled by a push button on the steering column opens the sand hopper and diverts exhaust pressure to the sand-distribution tubes.

3. Snow Tire Is Silent. Staggered grooves and interlocking cleats in the tread of this new tire give 1,940 gripping edges in snow or mud. It is free from rumbling noise, permitting year-round use.

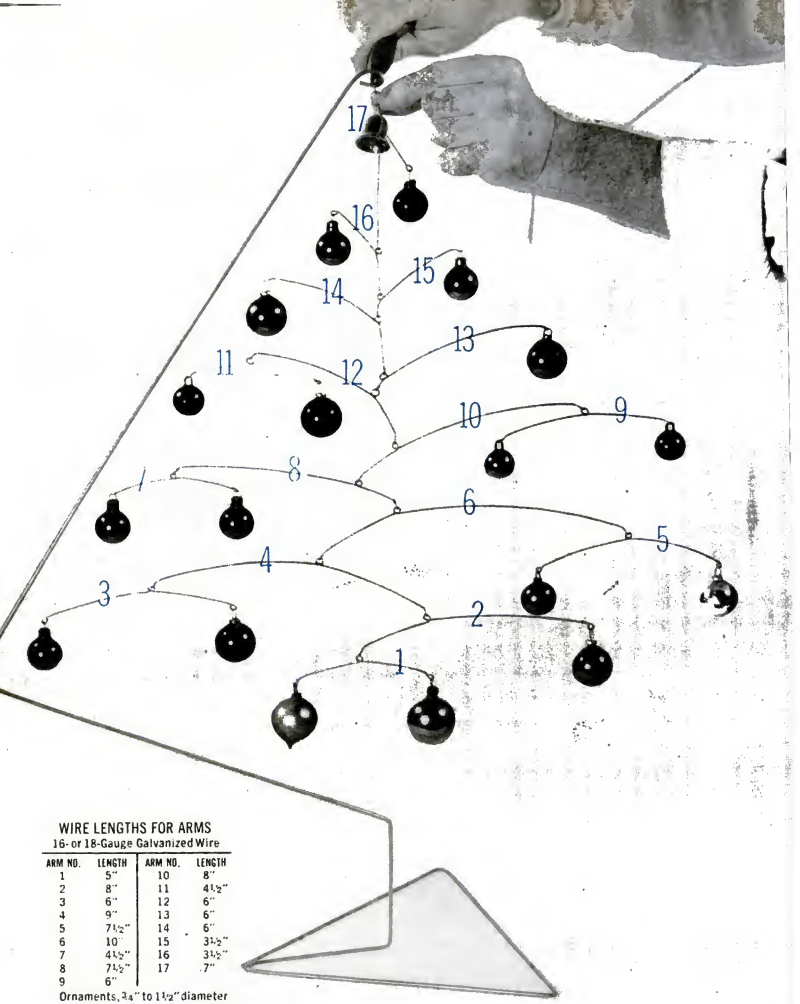
4. Lighter Has Ash Guard. When this lighter is in use, a telescoping sleeve slides out over the element to catch sparks or falling ashes. The sleeve also keeps the red-hot element from touching face or clothing.





5. Cartridge Rebuilds Brake Cylinder. In 20 minutes, you can restore your worn brake master cylinder to new condition by inserting a self-contained piston-and-liner assembly in the cylinder bore. The job can be done without removing the cylinder from the car. The cartridge fits most General Motors and Chrysler cars manufactured since 1941.

Further information on these products can be obtained from: 1. Alliance Mfg. Co., Alliance, Ohio; 2. Automotive Sandtrax, Inc., 20 Pemberton Sq., Boston, Mass.; 3. Armstrong Rubber Co., West Haven 16, Conn.; 4. Casco Products, Bridgeport, Conn.; 5. Hydraulyner Co., 1029 Madison St., Oak Park, Ill.



WIRE LENGTHS FOR ARMS
16- or 18-Gauge Galvanized Wire

ARM NO.	LENGTH	ARM NO.	LENGTH
1	5"	10	8"
2	8"	11	4½"
3	6"	12	6"
4	9"	13	6"
5	7½"	14	6"
6	10"	15	3½"
7	4½"	16	3½"
8	7½"	17	7"
9	6"		

Ornaments, ¾" to 1½" diameter

ALL MOBILES START FROM THE BOTTOM. It's impossible to begin at the top and continue adding weight without making adjustments for each new unit added. Numbers on the photograph above indicate the sequence of assembly, and the chart gives the approximate length of wire needed for each arm. The stand is bent from a 6' length of ⅛" wire or brass rod.

The way modern artists use bits and pieces in decorative designs may surprise you. You can experiment with novel Christmas decorations. The results will please and fascinate friends.

How to Make a Christmas Mobile

By John Lynch
of the Museum of Modern Art, New York City

TO MANY of us, mobiles are a familiar sight. They are a new art form created in the early 1930s and becoming increasingly popular as room decorations, and as settings for store displays.

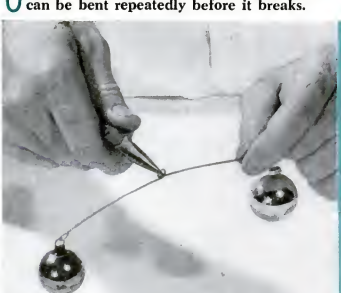
What are mobiles? Your guess is as good as mine. In their pure-art form, they aren't intended to represent anything. Most mobiles are abstract compositions of wire and metal, wood, glass or plastic shapes mechanically joined and delicately balanced to move with the slightest current of air. Frequently, though, they do take on more literal forms, like the Christmas tree above. But in any shape, making mobiles is fun. You put them together to please yourself and the result is like an abstract paint-

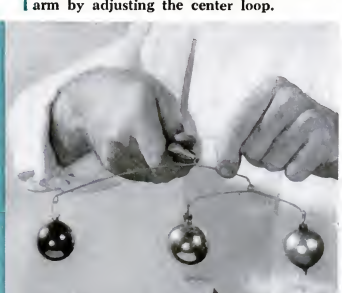
1 **PLIERS, WIRE,** and an assortment of Christmas-tree balls are the things you'll need to make a Christmas mobile. Here, end loops are being bent on a typical arm.

2 **FIND BALANCE POINT** by holding the wire gently between the sharp cutting jaws of the pliers. Most arms are asymmetrically balanced or heavy on one end.

3 FORM CENTER LOOP by rolling wire around pliers. Balance can be adjusted by rolling loop toward either end. Soft 16-gauge wire can be bent repeatedly before it breaks.

4 ASSEMBLE UNITS as they are made, beginning at the bottom of any type of mobile. Here, No. 1 arm is being balanced on No. 2 arm by adjusting the center loop.





5 USE BALANCE-TESTING TOOL (hooked piece of wire) to check composition as mobile develops. Ornaments shown vary in size from ¾″ to 1½″ in diameter.

6 DRAW OUTLINE OF STAND around completed mobile held flat against paper fastened to wall. Allow mobile to assume its natural position so stand will follow its shape.

ing with the added interest of movement.

About balance and composition. Both come to you more or less naturally. Balance is part of the composition and composition affects the balance. The size and shape of the pieces and the length and curvature of the wire arms make up the balance and the composition. For example: a 1/16″ brass disk, 5″ in diameter, will easily balance three or four similar disks of aluminum, and when they're painted, they will all look alike. The balance point will be nearer to the brass disk than the aluminum ones, creating an asymmetrical balance.

Use color for balance, too. While it will have no effect on the weight arrangement, it will balance the composition. Try your hand at making a gay Christmas mobile like the Christmas tree. Then you should have no difficulty with the abstract mobile that follows it.

Other ways of using your mobile

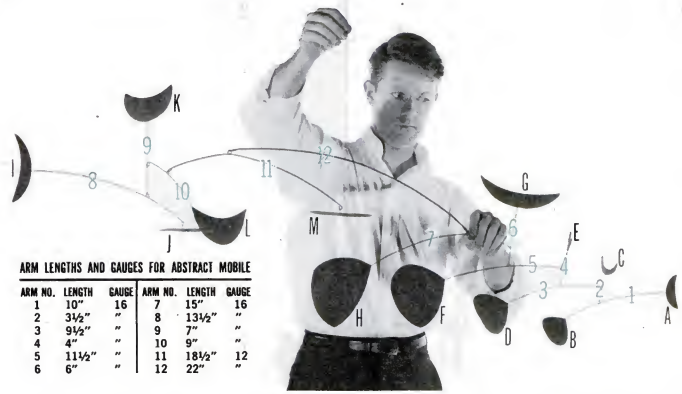
HAVING completed a mobile, the obvious question is, "What'll I do with it?" The stand shown in the construction photos is simple and effective, but a few variations can make your Christmas mobile even more interesting and attractive.

The easiest variation is in the mobile itself: try using bells or stars instead of balls—or mix 'em up. Paint the supporting arms red, green, silver or gold.

Much can be done with the stand, too. Make it two-sided to enclose the mobile completely, or bend the sides into scallops to resemble a Christmas-tree silhouette. Make the stand from plywood instead of wire, paint it and sprinkle it with metallic powder to make it sparkle.

Suspend the mobile from a wall bracket bent from ⅜" wire, or cut a Christmas-tree silhouette from plywood, paint it and fasten it to the wall to serve as a background for the mobile. Or, take the easy way and suspend the mobile on a string attached to the ceiling. However you use it, your mobile will be a center of attraction in your Christmas decoration.

How to make an abstract mobile



ARM LENGTHS AND GAUGES FOR ABSTRACT MOBILE

ARM NO.	LENGTH	GAUGE	ARM NO.	LENGTH	GAUGE
1	10"	16	7	15"	16
2	3½"	"	8	13½"	"
3	9½"	"	9	7"	"
4	4"	"	10	9"	"
5	11½"	"	11	18½"	12
6	6"	"	12	22"	"

YOU can really express yourself in an abstract mobile. Unlike the Christmas-tree mobile, which is a literal mobile designed to represent a definite object, an abstract mobile gives the builder free rein, unlimited as to shape, size or mood. The design and balance of an abstract mobile can make it move dreamily, solemnly or wittily—like the difference between an exuberant fountain and a lazy, meandering stream.

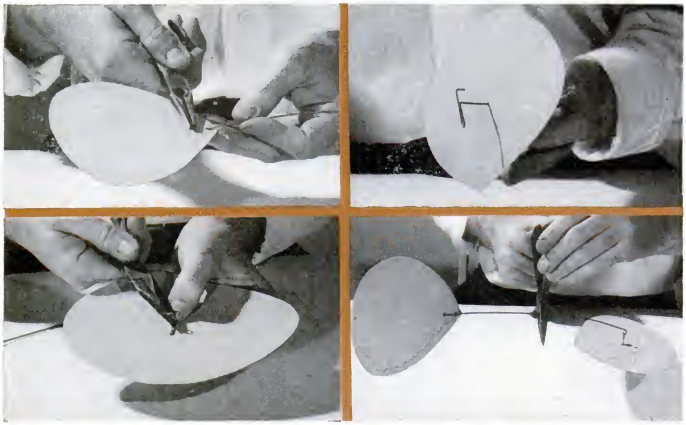
Patterns and arm lengths are given for this mobile to help you get started. Afterward, you'll create others yourself.

Please turn the page for more on mobiles

MOBILES Continued

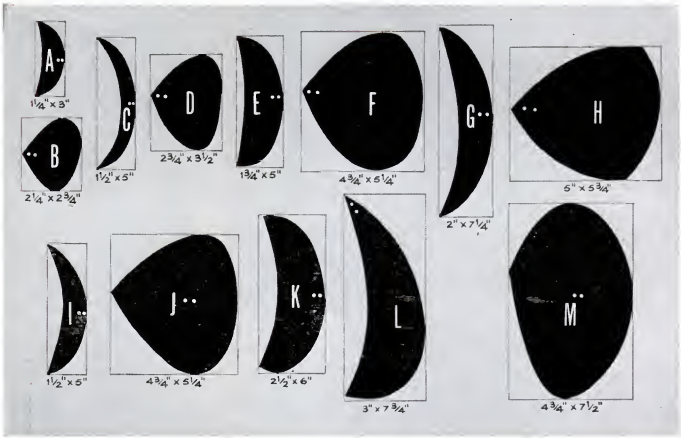
1 **BIGGEST DIFFERENCE** between abstract and Christmas-tree mobile is in method of attaching pieces. Here, wire arm is inserted in holes in vertical shape and bent over.

2 **HORIZONTAL SHAPES** (like *C* and *E* on preceding page) are suspended from their centers instead of their ends. Wire is preformed to shape shown below, then inserted in hole.



3 **SHORT END** is then bent over to clinch fastening. The supporting end is cut to desired length, then an eye is formed on its tip to join the matching eye in the arm.

4 **BALANCE IS FOUND** by gripping arm lightly between cutting edges of pliers. Note that arm is attached directly to vertical piece but linked to horizontal piece.



ABSTRACT SHAPES for mobile pieces. Cut rectangles of cardboard or light-gauge sheet metal to sizes given, then sketch the outlines of the pieces on them. This way, each piece is sized in advance and can be cut without bending or cracking the material.

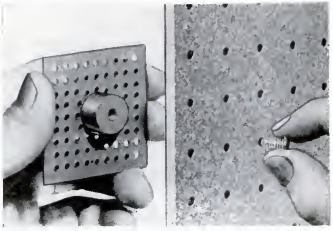
New for the Handy Man

1. Wallpaper Is Dunked in Water Box. You can hang this wallpaper without brush or paste. A rolled strip is soaked in the water-filled box and is ready to go up.

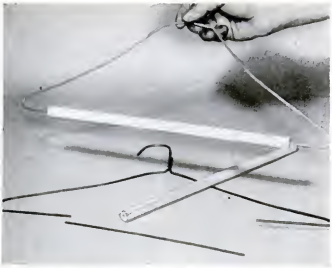
2. Plastic Tub Is Light. One man can carry and install this featherweight glass-fiber-and-plastic bathtub. It comes in five colors, two sizes: 17 lb., 46″ long; and 19 lb., 54″ long.

4. Anchors Hold Perforated Board. Putting up perforated hardboard is easy with these anchors. The small squares are cemented to the wall and have threaded spacers that hold the board away from the wall. Small bolts are screwed through the panels to hold them to the anchors.

3. Portable Stand Climbs Stairs. You can raise or lower the steel legs on this scaffold to make it stand firm on anything from an uneven floor to a stairway. Each leg is adjustable from 6″ to 36″. All four can be removed and stored under the 16″-by-48″ platform. One pair of legs has wheels, and by picking up the opposite end the stand can be rolled from job to job.



Further information on the products shown on this page can be obtained from : 1. The Birge Co., Inc., 390 Niagara St., Buffalo 1, N.Y.; 2. Carl A. Strand Co., Birmingham, Mich.; 3. Waco Scaffold & Equipment Div., 10-02 34th Ave., Long Island City 6, N. Y.; 4. Masonite Corp., Box 777, Chicago 90, Ill.



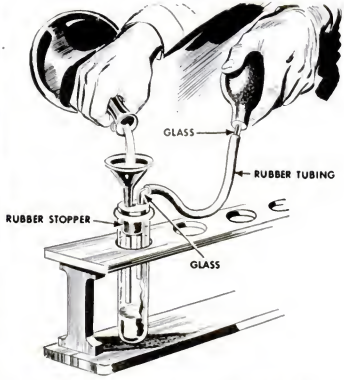
Dowel Hanger Avoids Wrinkles

YOUR trousers won't suffer from "coat-hanger crease" if you replace the cross bar of a number of wire hangers with a 10″ length of ½″ dowel. End drill the dowel an inch deep, cut out an 8″ section of wire, and spring the wire ends into place.—*Gilbert C. Close, Hawthorne, Calif.*

Wrap Putty to Keep It Fresh

TO KEEP putty from hardening in the can, remove it completely when you first open it, knead it into a ball and work from this. Then ball it up again, enclose it in plastic food wrapping and put it back in the can.—*R. L. Clough Jr., Bristol, Conn.*

▶▶▶A portable turntable for a TV set can be made from an old piano stool. Fasten a square of ¾″ plywood to the top.



Chemical Filter Made Quickly

AN EMERGENCY pressure filter to speed up home experiments can be made with this simple rig when more elaborate apparatus isn't available. Fit a large test tube with a two-holed rubber stopper, one hole for the filtering funnel and the other for a short bent-glass tube. A syringe bulb is then squeezed to remove air and attached to the glass tube with a short rubber tube. Letting go of the bulb creates a vacuum in the test tube that draws the liquid rapidly through the filter.—*A. Lapinsky, Benoni, So. Africa.*

DETERMINING AREAS

Triangle=base times half perpendicular height

Parallelogram=base times perpendicular height

Trapezoid=half sum of parallel sides times perpendicular height

Circle=radius squared times 3.1416

Ellipse=long diameter times short diameter times 0.7854

Regular polygon=sum of sides times half perpendicular distance from sides to center (altitude of triangle)

Cylinder=area of both ends plus circumference times height

Sphere=diameter squared times 3.1416

FOR YOUR *POPULAR SCIENCE MONTHLY* INFORMATION FILE

You may find how to improve your picture in one of these

8 Strange Tales of TV Antenna Troubles

By Art Margolis

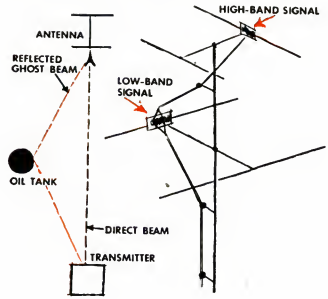
YOUR television set has a cozy spot in the living room and gets lots of attention. Its antenna roosts on the roof winter and summer with never a thought from anyone. Small wonder if it quits funneling shows downstairs.

As a repairman, I've seen these channel-grabbers do some strange things. Among my case histories you may find a diagnosis for your own TV trouble.

Case of the Bouncing Ghost

ONE day a customer in an old mansion complained about a ghost on Channel 10. From experience I knew enough to go up on the roof and look about. And there on the horizon sat a huge oil tank.

What was happening? Channel 10's signal was entering the TV antenna on a line-of-sight path. But it was also hitting the oil tank, bouncing off it and hitting the TV antenna again like an echo. The bounced signal, however, was losing the race by a gnat's whisker to the direct signal, creating a Johnny-come-lately image slightly to one side of the original one.



Luckily I had a ghost-laying trick up my sleeve. Each TV channel has a definite wave length, and if the antenna arms are cut to match one wave length, the antenna will favor that channel.

Here they had a low-band antenna favoring channels 2 to 6. The high-band Channel 10 signal was not getting much of a break. I added a high-band section cut for 10 and turned it until the ghost gave up and disappeared from the screen.

Snow in the Firehouse

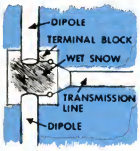
THICK snow was falling the day I found a childhood dream coming true. I was directing a group of anxious firemen as they set up a ladder for me to climb.

The TV set in their squad room pulled in all three local channels nicely, except when it snowed outside. Then Channel 10 would match the outdoor blizzard with a reasonable facsimile. By hooking up a "rabbit ears" antenna, which got 10 loud and clear, I pinpointed the trouble in the antenna system. So up I went.

The antenna was a dipole—two arms mounted on a plastic terminal block;

right away I examined the block and electrical connections, but nothing was wrong. Then I did a double-take.

There on the plastic terminal block, acting as an effective short circuit for Channel 10, was a layer of wet snow.



Why didn't it short out the other channels, 3 and 6? Because these low-band frequencies are less sensitive to leakage, while high ones (channels 7 to 13) will readily lose their energy to any bypath offered.

Armed with a clean brush and a pressurized can of plastic, I removed the snow and sprayed a plastic coating on the terminal block and its connections. This ended the blizzard on Channel 10.

The Flicker of an Eyelet

IN PHILADELPHIA, dwarfed by business buildings, is a block called Elfreths Alley, whose quaint houses, cobblestoned street and hitching posts once knew Benjamin Franklin and Betsy Ross. Here I found myself one morning checking a TV set. The complaint was flickering and flashing on the screen. It disappeared when I connected my rabbit ears to the set, so I made my way to the roof.

One of the eyelets that connected the leadin to the dipole had broken loose. As the loose wire fluttered in the breeze, it intermittently touched the connection. This showed up as flickering and flashing on the television screen.

With a good connection restored, the TV set went back to its job on the street where so much American history was made.

The Man Who Wanted Commercials

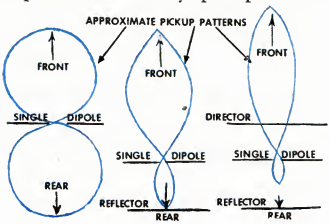
ONE afternoon I was dispatched to an advertising agency downtown. The head man had a TV set in his office. Channels 3 and 10 came in fine, but Channel 6 was ridden with auto-ignition spots, flopping and fading. Over his glass of milk my client told me that seeing his commercials thus twinged his ulcer.

On the roof, I could spot Channel 10's transmitter six blocks away. Channel 3 was visible about 10 miles north. You could have pulled these in with a bent nail. But Channel 6 was somewhere behind the skyscrapers.

The type, size and shape of an antenna determine its sensitivity "pattern." By choosing your antenna pattern you can make signal pickup either strong and highly directional, or weak and broad.

The advertising company had a single dipole with wide arms broadside to Channel 6. But a single dipole has a broad front-and-rear pickup pattern, and this one was letting all the downtown electronic noises waltz in along with the signal.

I pulled it down and installed a new antenna with a reflector. A reflector is called a "parasitic element," because it is not connected to the transmission line. Slightly longer than the dipole, the reflector is parallel to it and narrows down the pattern, while eliminating rear pickup. It made Channel 6 stronger by reflecting more of its signal back into the dipole. The one-way pickup also ex-



cluded a part of the interference.

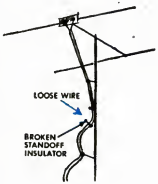
But there was still some, so I installed another parasitic element, a "director," this time in front of the dipole. This boosted signal strength and narrowed the pattern even more. The new skinny pattern pointed directly to Channel 6 and the interference hadn't a chance, while 3 and 10 still came in nicely.

The Picture the Wind Whipped

ONE blustery day I got a service call from a hotel. The symptoms annoying its guests were a Yo-yo-like bouncing and, in rhythm with this, a fading in and fading out of the picture. My faithful rabbit ears fingered the antenna as the villain.

A bellhop led me to a top-floor window that opened onto a rusty ladder clinging to the side of the building. I gulped, shakily crawled out on it, and got up to the peaked roof.

A broadcast TV signal induces high-frequency currents in the ribbon leadin wire, which pipes these down to the set. But as the signal rides down, it produces magnetic fields around the wire. I found that the hotel's leadin was loose because a standoff insulator on the mast had broken. The wind kept flapping the wire against the metal mast. This distorted the magnetic fields around the wire, making the picture bounce.



Quickly I installed a new standoff insulator and snugged the wire down. Then I made my way down the ladder.

The manager was pleased to have the set working, but I said somebody else could climb that rickety ladder next time.

"Ladder?" he said. "Why, there's a new elevator extension to the roof. You can't use that ladder. It's condemned!"

Detour Through the Den

SHE felt, my customer told her husband, like a witness at a Senate hearing. But I had to keep asking questions. These people were old customers who had always had clear pictures. Now the image had become unfocused and had lost fine detail. The antenna system was at fault but a quick check showed no reason for it. Finally my cross-examining paid off, for I learned that this couple, in the course of finishing their basement, had rerouted the TV leadin.

Following the ribbon from outside, I saw that it was passing above the new ceiling. They groaned when told some of the ceiling must come down.

You can't shoot the high-frequency currents from a TV antenna down any old piece of lamp cord. The antenna is an electronic circuit, endowed with an odd characteristic called "impedance."

The transmission line must also possess this characteristic and, what's more, the two impedances must match. If they don't, some of the energy never gets to the receiver. Impedance depends on many things, not all in the wire.

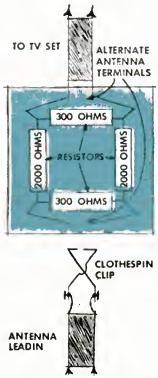
As my customers ripped out the ceiling section, I breathed a sigh of relief. The trouble was there. When they rerouted the leadin, they had neatly taped the wire to a handy copper water pipe. This proximity to metal had changed the impedance along that section, and the electrical energy was not getting past in full strength. Some was forced back up the line to become a reflection. Then it would try again, causing ghosts. I ran

the line away from the pipe. The beautiful basement was then a mess, but the TV picture was beautiful.

The Set That Had Too Much

ONE of my customers had it too good. There had been a championship fight in Philadelphia that no local channel had been permitted to show. But with his expensive high-gain antenna system and sensitive receiver, he had enjoyed the fisticuffs from New York. So why, I asked him, had he called me? Reluctantly, he showed me Channel 3. Because of his "hot" rig this local channel was overloaded. Even at minimum contrast setting, there were no grays, only dark blacks and bright whites, the picture rippling as if seen through water.

This was an uncommon problem: to make only Channel 3 weak. A TV signal has three parts: the sound portion, the picture action and the horizontal-vertical lock-in. Usually these are separated in the receiver. But if the signal is too strong, separation of these elements gets snafued. In this case some of the picture signal was creeping into the lock-in stages, creating the hula-hula act.



I had to weaken the overwhelming signal without altering the impedance match between line and set. Fortunately this is easy with a "pad."

On a small block of wood, I installed four low-wattage resistors and four antenna terminals. As the impedance of the line is calculated at 300 ohms, the signal enters the pad by way of a 300-ohm resistor. Then the signal runs smack into two 2,000-ohm resistors, and some of the excess energy is dissipated. Next, the weakened signal meets another 300-ohm resistor, which matches the signal properly into the 300-ohm impedance of the set. I added a clip so that the pad could be hooked in for 8 or bypassed. With it, the local picture was beautiful; without it, the set got New York.

Roof-Top Feud

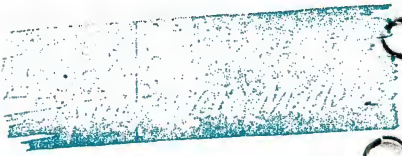
WITH murder in her eyes, Mrs. Hatfield told me that since Mrs. McCoy installed her new TV set, her own had not been able to get Channel 10. The ladies' semidetached homes had a common chimney on which both antennas were mounted, parallel and with mere inches separating Mrs. McCoy's reflector from my customer's dipole.

Now a reflector feeds energy back to the dipole, provided it is scientifically spaced from it so that the reflected energy arrives perfectly timed, or in phase, with the signal received by the dipole directly. But nobody had scientifically spaced Mrs. Hatfield's dipole from Mrs. McCoy's reflector. In fact, the spacing was almost exactly out of phase, so that the reflection was canceling out the signal that did reach the dipole.

I suggested to Mrs. Hatfield that I reinstall her antenna elsewhere, but she refused to give way.

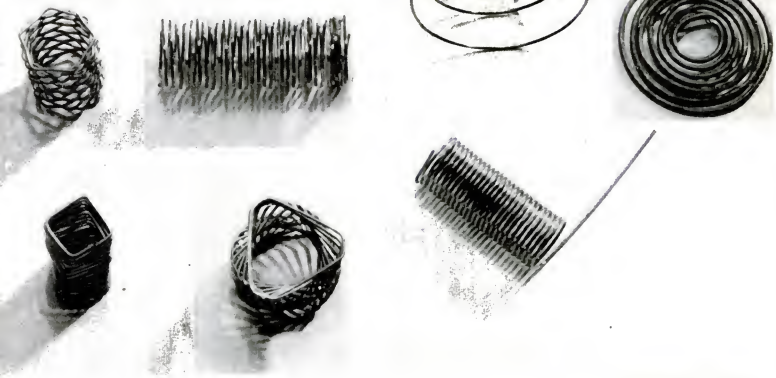
What I finally did was to lower Mrs. Hatfield's antenna by the prescribed distance a dipole should be from a reflector. Channel 10 snapped in immediately. Mrs. Hatfield was even more delighted when I told her that Mrs. McCoy's antenna was now working to improve *her* picture. This story is true. Only the names have been changed to protect you-know-who. END

Trick Springs and Round Rings



By Walter E. Burton

THESE trick springs work exactly like ordinary ones. They just *look* different. You know how a plain coil spring is made—just wind some wire around a rod and, *boinng*—the wire becomes a spring. The springs shown here came out of a springmaker's bag of tricks. That double-ender could suspend a bird cage in style, but if you didn't know the trick, you'd find it easier to make the cage than the spring. And those rings—ever try to make a perfectly round ring? Turn the page and see how you can make them by the dozen, and learn some spring tricks, too.



Trick Springs and Round Rings

You wind them just like common ones. The trick is in the mandrel you use.

SQUARE SPRING, believe it or not, is wound on a triangular-shaped mandrel. Though the coil appears triangular here, when winding tension is released, it unwinds into a square section. Automatic carriage feed of lathe controls spacing of turns. A square winding mandrel produces a spring composed of hexagonal turns, and a flat mandrel, such as a ¼"-by-½" bar, turns out a spring with triangular turns. The corners of the triangles form a spiral pattern on the coil resembling the helix of a screw thread.

FLAT COILS are wound between two collars fastened to a mandrel with setscrews. The chief difficulty is to start the wire so that a kink is not formed in the turns opposite the point where the beginning end enters the hole in the mandrel. A hand drill, clamped in vise, made this handy winding setup.

TWENTY-FOUR RINGS are made in one operation by winding a tightly spaced 24-turn coil spring and sawing it, as above, down the middle. Brass, silver or soft-steel wire is used. When winding any kind of spring, be careful when you release the tension so that the coil doesn't unwind violently.

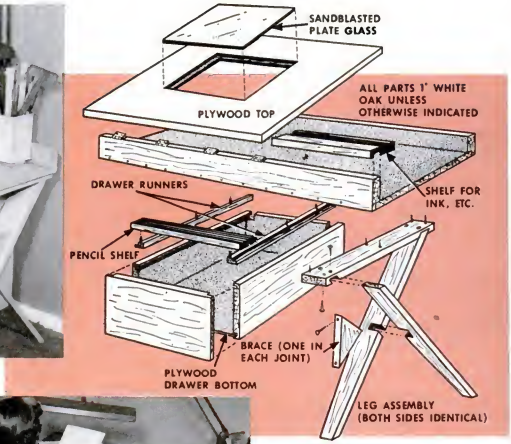
COMMON SPRING is wound around rod using simple hand jig shown here. Rod chucked in lathe running at slow speed makes the job easier and leaves the hands free. Slot (shown here) or hole in end of rod holds the starting end of wire to keep it from slipping as the coil is wound.

CONICAL SPRINGS are wound on tapered mandrel. Hole drilled in straight part at tip holds starting end. Soft wire retains shape of mandrel, but coils of hard piano wire open up when the winding tension is released, producing a spring that is nearly twice the size of the mandrel.

DOUBLE-ENDER, used for suspending bird cages or decorative accessories, needs special treatment because, with its tapered ends, it cannot be removed from solid-metal mandrels. Three steps for winding this spring are shown above. Left, dental plaster molded over steel rod is turned to desired shape. Center, wire is wound over form using gloves to protect fingers. (Take care, though, when wearing gloves around lathe.) Finally, at right, the spring is removed by cracking plaster out from inside it. Where a number of such springs are needed, clamp numbered washers on a rod and turn them to shape. Then when the spring is wound, the washers can easily be slipped out of coils one at a time. END

HOW I BUILT A Drawing Board

A DRAWING BOARD? This one looks more like a handsome piece of modern furniture. A sheet of plastic glamorizes the top of the board while it is not in use or when the builder's friends drop in.



EXPLODED VIEW above shows how the parts were assembled. A rabbet just as deep as the thickness of the plate glass brings the glass surface flush with the drawing-board top. The finish is in keeping with modern furnishings in the apartment.

IT'S THE FAMILY DESK, too. Keep the board down flat and you have a convenient place for typing, with good light and plenty of room to spread out pages of work.

"ISN'T there something you can do to straighten out this mess? The Joneses will be here any moment."

As a part-time artist struggling along on an apartment-sized desk and the dining-room table, I had to answer this sort of request almost nightly. It didn't take long to find that this arrangement in an apartment was anything but satisfactory. Something had to be done.

My answer is a desk-drafting board. It resembles a modern piece of furniture by day, but can be transformed quickly into a miniature studio by night. Best of all, the transition back to its daytime dignity is accomplished with a minimum of effort.

Many hours were spent in planning the unit. I wanted it to be attractive, and, more important, functional—offering convenient work and storage space, easy access to equipment and quick convertibility. More hours were spent in a workshop transforming the plans into reality. White oak was used for everything except the plywood drawing-board top and the sand-blasted plate-glass window.

To give you an idea what a similar desk could do for you, let's spend an evening watching it in use. Supper is over at seven, and the Joneses are expected about nine. There's just enough time in between to finish some work. So to the drawing board—on the facing page.

in the Modern Mode

By Matt Matthews

It's functional, yet blends with modern furnishings. For an idea of its easy convertibility, look at it in use below.

WITH ONLY TWO HOURS before guests are due to arrive, we decide to put the finishing touches on a couple of pieces of artwork. Casement-window assembly tilts board to position.

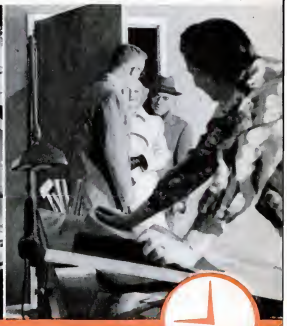
ROLLING BACK the plastic covering uncovers a partly finished drawing still taped to the board. Desired equipment is taken from the deep drawer, where it has been hidden during day.

A BIT OF AIRBRUSH WORK is next in order. The board is ideal for this—equipment at the right and nothing to shift around when the board is raised to vertical position for spraying.

RETOUCHING JOB is quickly done, too. For this, lamp is moved down to shine under board. We have found this tracing window especially useful.

UNDER THE BOARD, a roomy traylike space gives ample storage area for triangles, T squares, boards and various art materials which are always a problem.

HERE COME VISITORS. And quicker than you can say, "Please don't look at the mess," the board is covered, equipment is in drawer, room is shipshape.



Has some of your overhead plaster loosened from the lath? Here's how to avoid a costly replastering job.

Two Easy Ways To Repair Sagging Ceilings

UNDERSIDE repairs to a sagging ceiling call for more patience than work. Cut enough 1″ washers from tin-can stock to spot them at 8″ intervals.

Punch holes in the washers for wood screws and pound indentations around the holes to countersink the screw-heads. Starting at the perimeter of the sag, drill holes through the plaster and into the lath. Insert the washer-backed screws in the holes and draw up on them until the washers just touch the plaster. Repeat until you get to the center of the sag. Go back to the perimeter and, again working inward, draw up on the screws a little at a time until each washer is flush. Roughen the surface of the now firm ceiling, and spackle to hide washers and cracks.—*John H. Seval, Prattsburg, N. Y.*

TOPSIDE repairs are easy when sections of a plastered ceiling in a room below a floorless attic start to sag. Take a piece of ½″ plywood larger than the section that has broken away from the lath and cover its top surface with wax paper. Then, using a stout prop, shove the plywood up from below until it forces the plaster back in contact with the lath. One of the older types of auto jack, set under a notch cut in the bottom of the prop, will give you the muscles for the job where large areas of plaster must be raised.

Make sure the prop is firm. Then go upstairs with a broom and vacuum cleaner and remove all loose debris above the sag. Saturate the area with a strong solution of one of the water-soluble plastic resin glues. Leave the prop in place for a day or two. Then remove the board and you will find the plaster well bonded to the lath. Strip off the wax paper and fill all cracks with spackle. Sand and refinish. —*Roy L. Clough Jr., Bristol, N. H.*

What you should know about

Your Car's Wiring

You can avoid costly electrical failures by learning where and how to nip trouble in the bud.

By E. F. Lindsley

TAKE a complicated electrical hookup and a bunch of fairly delicate instruments, wrestle them into unlikely shapes and corners, shake the daylights out of them in all sorts of weather—and you've got the deal you give your car's electrical system in everyday driving. You also have an inkling of why electrical troubles rank so high on the service calls tallied up each year by the AAA.

Your chance of adding to these statistics will be reduced if you take a few simple precautions. These should include an electrical tightening-up and frazzled-

A CLEAN BATTERY with secure connections is first step in preventing an electrical breakdown in your car. Baking-soda-and-water paste will remove corrosion from terminals.

wire-hunting expedition twice a year—ideally at the fall and spring change-over. For the first check, however, the very best time is the day you bring the hack, new or old, from the shelter of the dealer's mothering wing to your own driveway.

If you were sharp enough to save a box of spare fuses in the trade-in, don't count on the cute little things too much. Fuses come in different ratings, lengths and diameters, so the old ones may be distinctly frustrating some dark night on the highway. The best check is in the car owner's guide, at the original dealer's, or in the fuse maker's index.

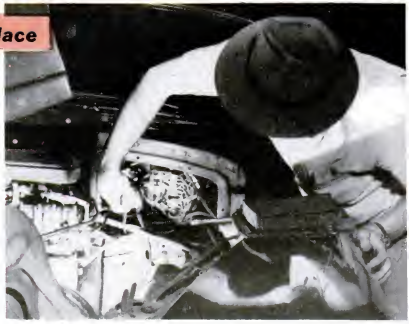
This is also a good opportunity to find out if your car has an automatic circuit breaker in one or more circuits. These don't call for fuses, but pop on and off, or simply buzz, until the short circuit or overload is located and repaired.

Nighttime Sport: "Finding the Fuse"

Most automobile fuses simply snap in and out of clips a lot less complicated than the snap on your wife's purse. But locating the fuse under the dashboard by the touch system in the dark will never grow into a popular sport. The smart operator takes the time on a bright sunshine-filled day to locate his fuses.

The usual spot for an important fuse is under the dash, often on or near the back end of the light switch. But many minor and accessory circuits have fuses inside the small barrel-type connectors, fairly close to the light or accessory. Look for these tricky beggars where wires have been tucked up into the inner bulkhead of a trunk deck, or look down under the edges of the trunk matting for wires running to accessory lights on the rear.

Never count on a long life for the first replacement fuse. The old one may have simply gotten tired and quit. But more likely a short or bare wire rubbing on the body or frame did the job, and will cause the new one to blow again. Here,



FUSES ARE WHERE YOU FIND 'EM. But most important ones are usually under dash. Buick (above) has a removable access panel that saves working in cramped under-dash space.

the writer prefers the nose method of investigation, smelling shorts out by substituting a piece of metal or a foil-wrapped fuse for the real thing and letting the bad wire get hot enough to make the insulation stink. A few quick whiffs in the trunk, or under the dash or hood, will probably spot the short in a hurry.

Naturally, this method lacks the highest technical approval and is not as safe as a continuity meter. So use some care not to start a fire.

If your car is suffering from hot flashes under the dash, you may have an octopus on the back of your ignition switch. This mare's-nest of meandering wires results from home-installed heaters, defrosters, radios and the like being hooked to the closest hot wire with the idea that when you chop the ignition and walk away nothing will be left cooking to run down the battery.

Taking the Wraps Off

Unfortunately, most ignition-switch screws just aren't big enough to digest all these wraps of wire. A better practice would be to clamp one husky strip of metal firmly under the screw and solder the extra leads to the strip so that they can be taped up as neatly as a mashed thumb.

ACCESSORY FUSES often are found inside connectors, like the tubular metal one shown above, which feeds radio juice. Look for such fuses under mats and metal panels in trunks.

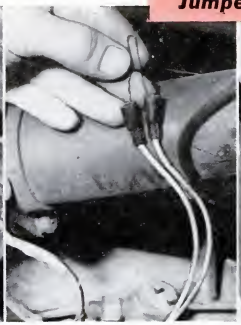
THE RIGHT FUSE will fit and do its job. Wrong one may fail, cause damage, or drive you crazy because it won't slip into clip. Car manual or fuse makers' books list the right ones.

Snugging up an electrical hookup starts at the battery. Very often, this goes for roadside trouble-shooting as well, so the time you spend running down loose terminal screws is a good stand-by education for the time you may have to do it by the glimmer of a cigarette lighter.

No battery is likely to do its best job with an incrustation of corrosion and crud on it. A fast and reliable wash for this condition is easily made by puddling up a thin paste of water and baking soda. This will remove the whitish crusts and take the fight out of the acid accumulations causing the trouble. Rinse the battery clear when done.

Unless the terminals are obviously in

Jumpers Test Continuity



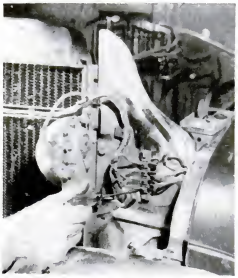
BOBBY PIN IS HANDY TEST JUMPER. Bulb can be tested across battery by grounding one terminal and jumping from other to hot side of battery. A pin shorted across stop-light leads (center photo) should light tail-end bulbs. If bulbs light on this check, but fail when brakes go on, a new switch is probably needed. Failure to light with the jumper means both bulbs bad (unlikely), or a broken wire or blown fuse.

PLIER HANDLES serve as jumper from hot terminal of battery to body ground. Sparks mean ground cable is at least connected and battery not completely dead. No sparks mean you'd better check woven ground strap in foreground for good connections. Next step: follow hot lead down to big terminals on starter.

first-class condition, you can't go wrong in disconnecting them and cleaning all the contact areas carefully with fine sandpaper.

Install new clamp bolts if needed, snuggle and clamp the connectors on the terminals securely, and coat the connectors and bolts with light grease or Vaseline.

From here on, a fast run-down with wrench and screwdriver, starting at the big terminals on the starter relays and working right out to the light junctions, will probably nip half a dozen loose connections in the harmless stage. Don't forget the connections under the dash, particularly at the back of the ammeter, ignition and light switches.



LOCATIONS OF TERMINAL CLUSTERS, like this one near radiator which feeds lights and horn, are handy to know. Some cars use plug-in connections which may sometimes be pulled loose accidentally.

When you're sure all the electrical connections are firmly attached at the proper places, you can pretty well dismiss from your mind the likelihood of serious failure on the road. Once in a while, however, breakdowns of the "everything went black" variety will stop you cold. If nothing works—lights, starter or any of the gauges—the battery has either fallen out of the car or one of the big cables to the ground, or feeding the system, is broken or disconnected.

Pliers Make Sparks Fly

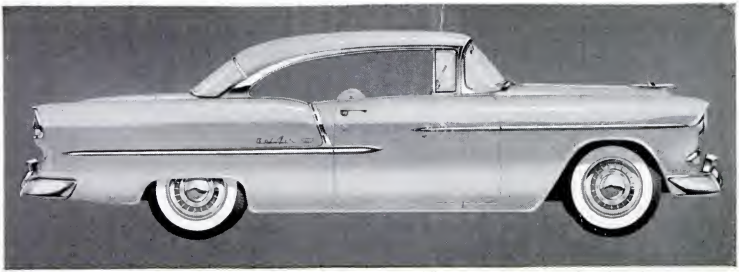
Lacking a jumper lead and instruments, a pair of pliers with the handles spread wide can be compassed across from the ungrounded battery terminal to a bare spot on the metal of the car. A quick flash tells you the ground cable is making contact. No flash means no ground. Play around with the woven ground strap until you find what's loose. Blue sparks tell you to try another flash check at the next logical point—usually the big connection somewhere on or near the starter where the heavy cable from the battery latches on. Make a few tentative wiggles with the cable and see if any sparks look back at you or if your lights flicker. An all-out failure to produce any juice at all is usually easier and faster to find and fix yourself than it would be to call a repair truck.

Lesser electrical breakdowns such as a tail-light, headlight or accessory-light failure can, of course, always boil down to a bulb. As a first shot, make sure the light and its socket are firmly seated and grounded. If you tote a variety of junk in the trunk, wires or bulb holders can often get themselves entangled and jerked out by the roots. A next bet for a quick check of the bulb would be to use the pliers or a scrap of wire for a jumper. Touch one terminal of the bulb with the jumper from the battery or other hot terminal, while holding the second terminal, or base of the bulb, against a bare-metal ground.

Unless the bulb is a trick one with a shaky filament, lighting up means that the bulb is working. Now clean the end of the lead wire to the light and flash it against a ground. No flash probably means a loose wire or a short and a burned-out fuse.

Directional lights and tail-light stop signals both have an extra gimmick with which to amuse yourself. If directional lights flash on only one side, or not at all, and the wires and bulbs seem to pass inspection, borrow a new flasher unit and see what happens.

The tail-light switch ties in with the hydraulic-brake system. If you suspect its honesty, short across its terminals with a screwdriver. No flash from the screwdriver means no current getting to the switch. Check the wires. If the lights operate with the screwdriver but not with the brakes, you'd better buy a new switch. END

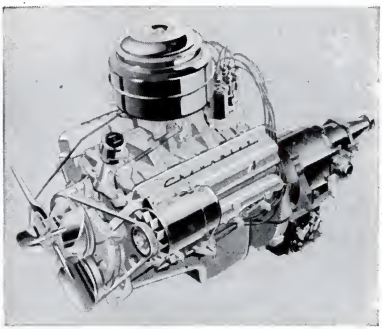


The smartest yet—1955 Chevrolet Bel Air Sport Coupe

Everything's new everywhere you look!

the motoramic

Chevrolet for '55



New 162-h.p. V8 has 8 to 1 compression ratio—and the shortest stroke in the low-price field.

NEW Show-Car styling—new Sweep-Sight windshield—three *new engines ("Turbo-Fire" V8 and two new "Blue-Flame" 6's)—new Glide-Ride front suspension—new outrigger rear springs—new Anti-Dive braking control—new ball-race steering—new 12-volt electrical system — new standard shift transmission or (optional at extra cost) new Overdrive transmission or improved Powerglide, new and improved automatic power helpers.*

Chevrolet pulled out all the stops this year, threw every ounce of engineering and production skill into creating a car that is brand-new all the way through. We can't even begin to list all the changes here . . . all the new handling ease, roadability, riding comfort, visibility and wrapped-in-plush luxury. You'll have to drive it to know what the word *new* really can mean . . . when the world's leading manufacturer of cars touches off a revolution! See your Chevrolet dealer for a demonstration. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

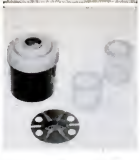
More Than a New Car ..a New Concept of Low-Cost Motoring!

Easy-to-use materials for printing pictures—ideally suited for beginners. **Kodacraft Printing Kit, $5.25.**

Essentials for developing and printing pictures, including roll-film tank. **Kodacraft Photo-Lab Outfit, $9.75.**

Complete developing, printing equipment incl. metal printer. **Kodacraft Advanced Photo-Lab, $14.95.**

For efficient print drying. Capacity—60 average-size prints. Use it over and over. **Kodak Blotter Roll, $2.88.**



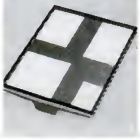
Easy to use. Simple to load in dark. Takes 620, 120, and 127 roll films. **Kodacraft Roll-Film Tank, $2.53.**

For simultaneous development of two rolls of 828 or 135 film. **Kodacraft Miniature Roll-Film Tank, $2.53.**

Shop here for that just-right Kodak gift for everyone

These two pages are a sample of what you can see at your Kodak dealer's. He'll be happy to help you choose the right gift for every name on your Christmas list.

For accurately controlling darkroom solution temperatures. Choice of four **Kodak Thermometers,** from $.55.



New-type printing frame of steel construction. Includes a set of masks. **Kodacraft Printing Frame, $1.65.**

Converts tray to efficient, trouble-free washer for prints or films. **Kodak Automatic Tray Siphon, $4.50.**

3 trays with rockers for uniform developing of average-size prints. **Kodacraft Rocker Tray Set, $1.95.**

For handling prints in tray; for stirring solutions. Handle top crushes chemicals. **Kodak Stirring Paddle, $.35.**

Includes three cups for darkroom work with both papers and films. **Brownie Darkroom Lamp Kit, $1.75.**

New darkroom safelamp provides direct or indirect illumination—or both. **Kodak 2-Way Safelamp, $5.25.**

Can be used either from a drop cord or in a wall plug. Includes safelight filter. **Kodak Darkroom Lamp, $5.75.**

For wall, shelf, bench. Includes switch, cord, safelight filter. **Kodak Adjustable Safelight Lamp, $9.75.**

Tilting base, minute and split-second hands, large dial. Intervals up to 60 minutes. **Kodak Timer, $7.95.**

Cool, circline fluorescent lamp, and integrating-sphere lamphouse are prominent features in each enlarger. **Kodak Hobbyist Enlarger** *(left)*, **$57.50,** complete with f/6.3 lens. **Kodak Fluralite Enlarger** *(right)*, **$99.50** (lens extra).

Kodak Enlarging Lenses range from 50mm. f/4.5 "Ektanon" to 4-inch f/4.5 "Ektar." All superb value, from **$15.**

For determining correct printing time—saves both paper and time. **Kodak Projection Print Scale, $1.15.**

View-type camera with long bellows. **Kodak Fluralite Camera Combination, $69.50** (less lens).

Expertly made Kodak Field Cases make cameras easy to carry, offer sound protection together with smart appearance. Include fine-quality leather cases *(left)*, and durable simulated leather *(right)*. **Kodak Field Cases,** from $2.65.

Automatically trips shutter, permits photographer to get into picture. **Kodak Auto-Release,** $3.86.

Provides dependable "flash" for most internally synchronized cameras. **Kodak Standard Flasholder,** $7.95.

B-C (battery-condenser) flash insures longer battery life, sure "synch." **Kodak B-C Flasholder,** $9.95.

For quick, easy multiple lighting. Lumaclad reflector. **Kodak Flasholder Extension Unit,** Model 1, $11.

Condenser-type power for dependable "flash." **Kodak B-C Flashpack** (without 22½ volt battery), $2.95.

Versatile battery-condenser flash system. **Kodak Ektalux Flasholder** (including bracket), $19.75.

Holds your camera and flash extension unit on most flat or tubular surfaces. **Kodak Flexi-clamp,** $4.95.

For Brownie Hawkeye and Kodak Duaflex III Cameras. Exceptionally easy to attach. **Kodalite Flasholder,** $4.

Permits close-range picture taking with most fixed-focus cameras. **Kodak Close-Up Attachment,** $1.63.

Now, a filter designed for inexpensive box cameras—emphasizes clouds. **Kodak Cloud Filter,** $1.85.

It's easy to get extreme close-ups with both still and movie cameras with **Kodak Portra Lenses,** from $2.65.

Shades camera lens and reduces sky flare—attaches to adapter ring. **Kodak Lens Hood,** from $1.75.

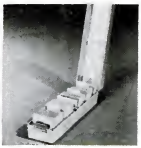
Popular yellow (K2), red (A), and green (X1) filters to fit most cameras. **Kodak Wratten Filters,** from $1.75.

500-watt lamp; automatic take-up changer; impeller blower. **Kodaslide Signet** 500 Projector (f/3.5 lens), $72.50.

Vertical slide-feeding mechanism, cool operation, elevating device, **Kodaslide Merit Projector,** $23.95.

Two superb color slide projectors. **Kodaslide Highlux III Projector** *(left)*, 300-watt; quiet fan; blower, carry case, $54.75. **Highlux II** *(right)* gives brilliant 200-watt projection. Converts to Highlux III. $35.35. Carry Case, $7.50.

Handiest way to view 2 x 2-inch color slides. Magnifies 4 times. Folds flat. **Kodaslide Pocket Viewer,** $1.95.



Compact storage for 200 Kodak Ready-Mounts, 66 gloss slides. **Kodaslide Ready-File,** $1.95.

Holds 240 cardboard or 96 gloss slides. **Kodaslide Compartment File,** $3.94.

Holds 360 2 x 2-inch or 160 stereo slides. **Kodaslide Flexo File,** $.95.

Materials for mounting 50 color transparencies in gloss. **Kodak Slide Kit,** $3.63.

Prices include Federal Tax where applicable and are subject to change without notice.

Many Kodak dealers offer convenient terms

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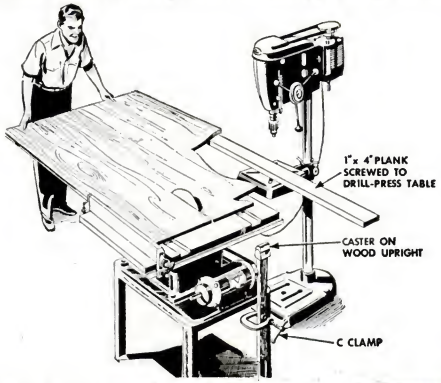
Kodak
TRADE-MARK

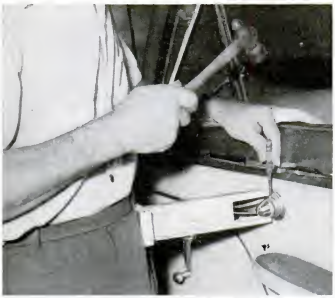
How a Drill Press Can Double as a Saw-Table Extension

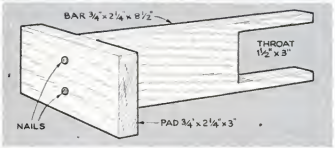


When I have a big piece of plywood or wallboard to cut, I move the circular saw close to my pedestal-type drill press and set the drill-press table 1" lower than the saw table. Then I fasten a long strip of one-by-four to the top of the drill-press table with a screw and washer, from below. I clamp a second strip to one of the back legs of the saw table. This strip has a caster at its upper end, flush with the top of the saw table.

The additional supports make easy work of 4'-by-8' panels.—*Lieut. John C. Martin, Kings Point, N.Y.*

Tool Helps Service Car Doors





Installing upholstery covers and servicing auto locks and window lifters calls for the removal of window cranks and door handles. This simple wooden tool makes the job easy.

Place the end against the garnish ring and press against the pad with your hip. The pin or horseshoe lock is thus exposed, while you have both hands free to remove it.—*Ivan Grosvenor, Indian Rocks, Fla.*

Turps Cans Carry Sorted Nails

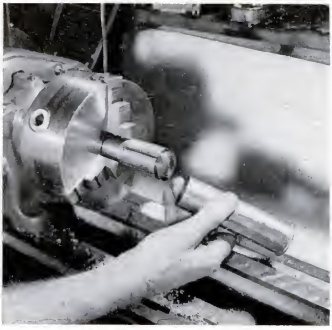
These handy nail bins, made from gallon turpentine cans, can be carried right to the job without transferring their contents to other containers. Cut away one corner of each can along a 45° diagonal starting about ½" above the handle, then bend in the edges to make a smooth rim.

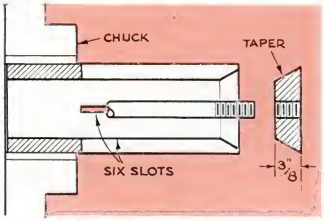
You can resolder the handle closer to the edge, as above, or use the type that has an off-center handle and leave it in place. Painted different colors, the bins will show you at a glance just where each nail size is.—*Daniel I. Hadley, Kensington, Md.*

Blotter Cleans Typewriter Keys

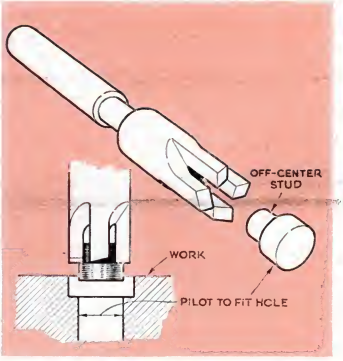
To clean the keys of a typewriter before cutting stencils, or if you want good clean copy in regular typing, put a sheet of blotting paper in the machine with the typewriter set for stencils and use each key half a dozen times.—*John C. Craig, Edmonton, Alberta.*

NEW Shop Ideas



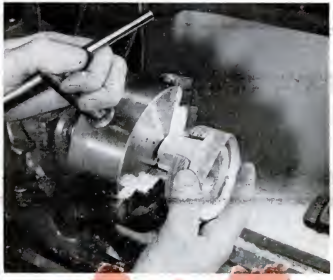


Collet Grips Tubing. Machining thin-walled tubing without crushing it in the chuck jaws is made easy with an expanding collet. Cut slots in a piece of slightly smaller tubing, taper-bore the end, and fit a tapered plug to be drawn in by the regular drawbar or a long bolt. Then turn the collet to a push fit for the work. Expanded against the inside, the slotted tubing will grip it tightly.



Counterbore Takes Larger Cut. When a counterbore is just a bit too small for a job, you can make it do by creating deliberate run-out with an off-center pilot. Because this puts all wear on one or two teeth, work should be limited to a few pieces.

Turn a pilot to fit the hole in the work. Rechuck on this diameter, with a shim under one jaw to throw it off center by half the required oversize and turn the pilot stem to fit the tool. Mount the counterbore on a lathe center or, if in a chuck, with enough overhang to let the cutting end run eccentrically.

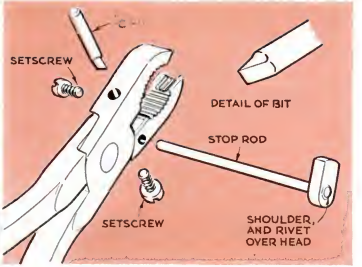


Collar Locates Lathe Work. When a batch of aluminum castings had to be chucked for duplicate turning, their shape made it difficult to position each one the same way. With the plywood collar shown, positioning was automatic and stops could be used for lathe operations.

The collar, notched to fit the work, bears against the ends of the chuck jaws. The casting is pressed against it and the chuck tightened. Then the collar is slipped off.—*John J. McGuckin, Ridgewood, N. J.*

Please turn the page for more shop tips

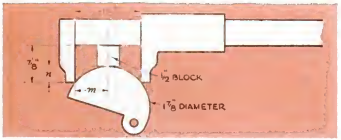
MORE SHOP TIPS



Pliers Cut Off Pins. Pins of any length can be quickly cut from brass rod with these converted pliers. One jaw is drilled to take ⅛″ drill shank which has been ground to a V point.

The other jaw is drilled for a stop gauge to aid in cutting uniform lengths of rod.

In use, the stop is set for the length of pin needed and the pliers closed over the rotating rod to force the tool bit slowly into it. The rod can be chucked in a lathe, drill press or electric drill.



Calipers Give Radius of Segments. When duplicating machine parts or other odd-shaped pieces, it is often impossible to determine the radius of some curved surfaces. Using the method below, you can compute radius or diameter from simple measurements.

Place a vernier caliper across as much of the work surface as you can get between its jaws and insert a measuring block of known dimension between the scale and the top of the work, midway between the jaws. Press the caliper firmly on the block and close the jaws on the workpiece. Read the caliper and divide the reading by half to get dimension m. Subtract the thickness of the block from the length of the caliper jaws to get dimension n. Then use the formula $D=\frac{m^2+n^2}{n}$ to get the diameter of the workpiece. Divide this by two in order to get the radius.

In the example shown, dimension m is .750″ and n is .375″. So, m^2 is .562″ and n^2 is .140″. Added together, they make .702″. Then .702″ divided by n, .375″, gives 1.872″, or only .003″ away from the actual 1⅞″ diameter of the workpiece.

Save Broken Centerdrills. Grip them in a hand chuck or weld a permanent T handle to one end for use as a reamer or deburring tool for tubing or drilled holes.—*Phil McCafferty, Stanwood, Iowa.*

Shingles Level Work. Two pieces of wood shingle placed together so that their tapers are opposite provide an easy means of leveling work for drilling or machining. Sliding the pieces together elevates the work with almost micrometer accuracy.

THE GREATEST INVENTION SINCE THE HAND SAW . . .

New AMF DeWalt "Power Shop" brings out the expert in you!

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$229 delivered (saw blade and custom-built ½ H. P. motor included). EASY TERMS.

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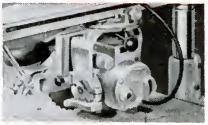
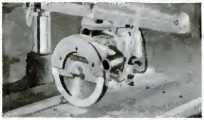


PROFESSIONAL ACCURACY! Calibrated scales for miter, bevel and rip are visible above table. Instantaneous settings!

EASY TO USE! You control ball-bearing travel head in radial arm. Moves smoothly, precisely. All cuts perfect—no spoilage.

COMPLETE VERSATILITY! One powerful direct-drive motor accommodates any circular tool—gives full home workshop flexibility.

NO FLOOR SPACE NEEDED! Builds into your workbench! When not in use radial arm swings conveniently out of way, freeing work area.



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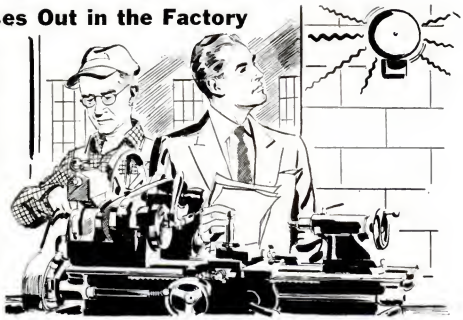
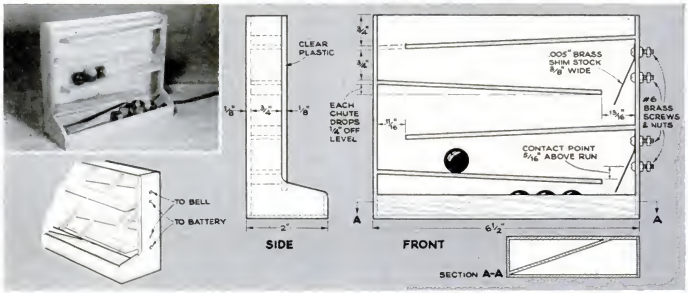
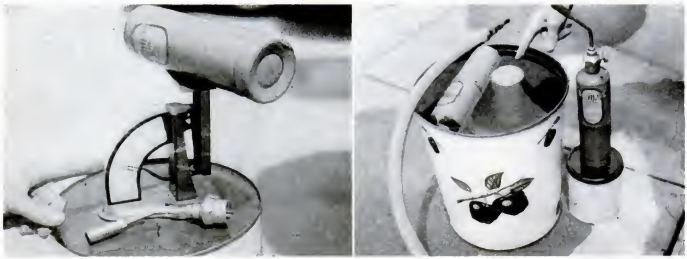
Marbles Page Bosses Out in the Factory

THIS pinball call box pages roaming executives in a large manufacturing plant. Each boss is given a number and when a call comes in, the secretary in the front office selects a corresponding number of marbles and drops them into the top chute. The marbles must force their way past two light spring contacts to get to the bottom, and in doing so, each marble rings the call bell twice.—*J.M. Finn, Pittstown, N. J.*







Weighing Shows Amount of Gas Left in Disposable Cylinder

WANT to know if there is enough gas left in a disposable torch tank to do a job, or whether to buy a refill at once? You can't look inside, or feel the contents by shaking. But its weight will tell you.

A full gas cylinder for torches of the make shown (models TX-10 and TX-11) weighs 34 ounces. Half full, it weighs 28 oz., quarter full, 25 oz., and empty 22 oz. Remove the burner before weighing.

If you have no scale handy, put the cylinder in water. A full one will float upside down, the end just awash (at right in photo). An empty cylinder floats horizontally, well above the water line.—*Andrew Vena, Philadelphia.*

Texaco Tips on car care

How to keep your windshield from freezing over

Freezing rain, sleet or snow on your windshield is one of winter's worst driving hazards and can cause serious accidents. Good way to prevent freezing is to rub a *thin* film of glycerin on the windshield with a cloth. Be sure to wash off the glycerin film after the storm because it tends to collect road dirt.

How to get that "cushiony" ride

Turn all your driving miles into pleasure miles. Keep your car's chassis protected with *Marfak*. This tough, elastic lubricant clings to vital points of friction *longer* (note the "collar" of *Marfak* guarding the universal joint). *Marfak* resists squeeze-out, jar-out and wash-out, too. In your car, this means one thousand miles or more of *cushiony*, smooth riding. Drive in for longer lasting *Marfak* lubrication. See your Texaco Dealer . . . *the best friend your car has ever had.*

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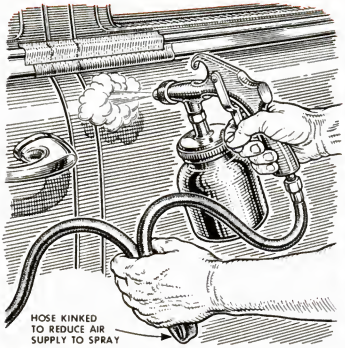
TUNE IN . . . TEXACO STAR THEATER starring DONALD O'CONNOR or JIMMY DURANTE on Television . . . Saturday nights, NBC.

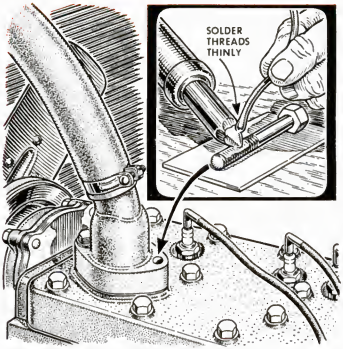
Hints FROM THE MODEL GARAGE

Shoe-sole repair kit, which can be bought in most five-and-dime stores, gives you the makings of a first-rate patch for that worn-out section of floor covering under the gas pedal. Trim one of the rubber soles, as shown, and cement it firmly in place.

Caught in bad weather with a wiper blade that doesn't clean the windshield well, try switching it with the one on the passenger's side. Chances are the right-hand blade is in better shape; it gets less mud and sand tossed at it by passing cars.



Save time on touch-up paint-spray jobs by kinking the air hose slightly with the left hand to reduce paint-spray volume temporarily. It's easier than making numerous adjustments on the air regulator to prevent overspray and time-taking clean-up jobs.



Stop leaks around bolt threads that can't be sealed with new gaskets by removing the bolts and floating soft solder over the threaded area with a soldering iron or torch. Leave the first few threads untinned for easy bolt replacement.

 Please turn to page 228 for more auto hints

Ask her for the FINEST POWER TOOLS MADE

MILLERS FALLS TOOLS
SINCE 1868

Faster than 10 Men with Handsaws. Millers Falls portable electric saws are powerful, safe, easy to use. Built-in angle and depth adjustments, adjustable ripping guide. No. 600 — a new, fine-quality 6" saw, $43.50. No. 610, shown — husky, heavy-duty 6" model, $59.50. No. 700 — larger, with full 7" blade, $67.95.

Mighty useful. There's power to spare for hundreds of jobs with this rugged new Millers Falls ¼" Drill. No. 1814 Drill alone, $22.35. In complete, accessory-packed Deluxe Drill Kit No. 8142, $42.25. Other Millers Falls drills from $19.85 — kits from $29.95.

Sand and polish with any ¼" electric drill. Complete with 5" rubber pad, 5" lambswool bonnet, two 5" sanding discs. No. 2120 Universal Buffing and Sanding Attachment, $8.45.

Fits any ¼" electric drill. For work in corners, between studs, and other hard-to-get-at places. No. 2130 Universal Right-Angle Drive, $4.95.

Universal Jig Saw Attachment. Converts any ¼" electric drill into an efficient saw that cuts straight or curves. Capacity ¾" in wood, ⅛" in metal. Needs no starting hole in wood — cuts own way through. Complete with 4 saw blades. No. 2140, $10.95.

New "Dyna-Mite" Power Wood Bits with high-speed steel blades. Stay sharp 10 times longer — even cut through wire nails without damage. 6 diameters — ⅜" to 1" — all with ¼" shanks. Singly or in sets. No. 8006 set of 6, $6.45.

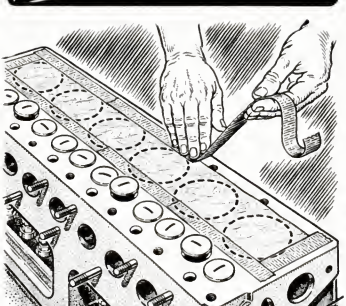
Here's the Spectacular New Millers Falls 888 POWER UNIT

The Start of a Complete Power Workshop for Only $39.95

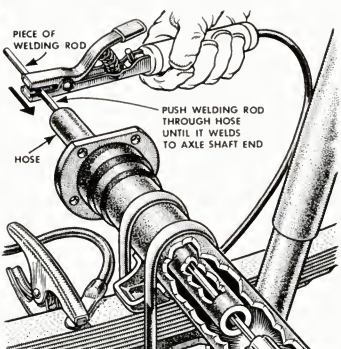
Basic 888 Power Unit at right comes equipped as a powerful (4.0 amps.) ⅜" drill, 6" disc sander, and 6" polisher — $39.95. It converts into 8 additional power tools by means of beautifully engineered, inexpensive attachments: 1) No. 8811 6" Portable Saw, $15.95 — 2) No. 883 6" Bench Saw, $22.95 — 3) No. 882 Orbital Sander, $15.50 — 4) No. 886 Portable Jig Saw, $9.95 — 5) No. 881 Bench Stand, $2.95 — 6) No. 889 6" Disc Bench Sander (also requires No. 881 Stand), $7.95 —7) No. 8810 4" Bench Grinder (also requires No. 881 Stand), $5.95 — 8) No. 887 Jig Saw Table (converts No. 886 to Bench Saw), $1.75. Special Bulletin at your hardware store or on request.

If your dealer cannot supply you, send check or M.O. for postpaid shipment—Millers Falls Co., Dept. PS-5, Greenfield, Mass.

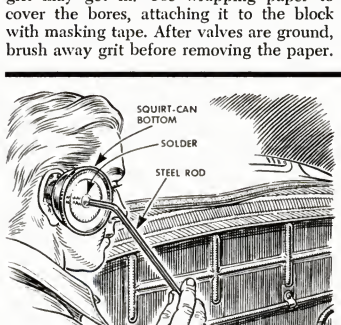
MORE Hints from the Model Garage



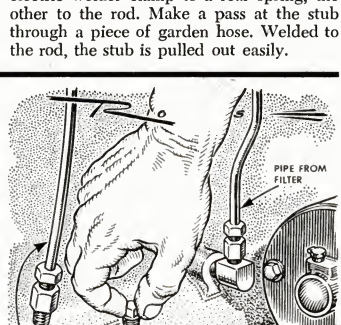
Cover cylinder bores before you grind L-head engine valves. Otherwise, damaging grit may get in. Use wrapping paper to cover the bores, attaching it to the block with masking tape. After valves are ground, brush away grit before removing the paper.



Use welding rods to remove broken axle stubs. Tack two rods end-to-end. Clip one electric welder clamp to a rear spring, the other to the rod. Make a pass at the stub through a piece of garden hose. Welded to the rod, the stub is pulled out easily.



Locate hard-to-find engine knocks with a homemade stethoscope. Make a right-angle bend near one end of a curtain rod, and solder this end to the bottom of an oil can. Probe the engine block with the rod, holding the can mouth to your ear. Diaphragm-amplified sound is easily spotted.



The right-size pipe plug, stored in your car's tool chest, can save you a lot of trouble if a bypass-type oil filter or its lines develop a leak out on the road. Remove the inlet tube where it couples to the engine block, insert the plug, and your emergency repair will get you home.

Ask for a ROCKWELL-BUILT

DELTA SHOP

for a Christmas of a Lifetime....

...So easy to get "A-Tool-At-A-Time"

Here's the "do-it-yourself" power tool most men really want—the Rockwell-built DELTASHOP—the only combination tool made up of full-size power tools and arranged in the natural woodworking sequence—the only one motor combination tool you can buy either complete (as shown at left) or through the sensible "Tool-At-A-Time" Plan.

Here's How Easy DELTA SHOP "Tool-At-A-Time" Plan Works

1 Start with the precision-built Hamecraft 8" Circular Saw—

PACKAGE #1 (Hamecraft 8" Tilting Arbor Circular Saw and Stand)** **Only $109.80***

2 Next add the Hamecraft 4" Jainter—

PACKAGE #2 (Homecraft 4" Jainter) **Only $49.15***

3 Then add the Homecraft 11" Drill Press—

PACKAGE #3 (Hamecraft 11" Drill Press) **Only $57.50***

4 Now, get the Hamecraft Disk Sander—

PACKAGE #4 (Homecraft Disk Sander) **Only $17.55**

5 Finally, the new Homecraft Saber Saw for cutting intricate curves—

PACKAGE #5 (Hamecraft Saber Saw) **Only $14.95**

Other Delta Gifts from 50¢ to $200

There's a complete line of individual Delta Tools—all of them ideal Christmas gifts. You could ask for a circular saw, jointer, drill press, sander, band saw, scroll saw, shaper or lathe.

Or—ask for the Delta accessory you've been wanting for the Delta Tool you already own. See your Delta Dealer (he's listed in the classified pages of your phone book under "TOOLS" or "MACHINERY"), or write for catalog to: Delta Power Tool Division, Rockwell Manufacturing Company, 504M North Lexington Avenue, Pittsburgh 8, Pa.

DELTA ROCKWELL

DELTA QUALITY MAKES THE DIFFERENCE

*prices slightly higher in western region **motor extra

DELTA QUALITY POWER TOOLS

Another Product by

Rockwell

[*Continued from page 152*]

turn around and she won't back up." Under Gus's coat, he caught a glimpse of red. "Hey," he said, "you really *are* Mr. Santa Claus tonight, aren't you?"

The little car stood on a side road that led steeply down from the highway to a gravel pile the highway department had put in reserve for the winter. Gus parked on the highway shoulder, put out flares, walked down toward the car with a small tool kit in his hand. Softly falling snowflakes fluttered in the flash beam like moths.

The bumper of the car was hard against the steep side of the gravel pile. There was no room to turn around, but no reason, as far as Gus could see, why the car couldn't back out.

On This Night—No Easy Way Out

"I could tow you out, sailor," Gus said grimly, "but I won't. There could be a lot of uses for reverse gear on a night like this in a hundred miles."

Gus started the motor, put the car in reverse, eased up on the clutch. The motor took hold of the load, started to move the car back, and stalled. Good Lord, Gus thought, even this little engine should have more power than this. He tried several more times to back out, but each time the motor killed when it took the load. He got out, raised the hood, and worked the throttle linkage. The motor opened up from idle to high speed with a throaty roar.

Gus turned his flash on his wrist watch. He had just 25 minutes to get on the schoolhouse stage. He felt a rising of panic, shook it off. No man, he thought, could think clearly with his wind up. Calmly he pulled out his pipe, lit it.

Once again he got in and tried to back the car out. When the motor died he leaped out, thrust his head beneath the hood, nostrils expanded. He detected the faint but unmistakable odor of ozone, that distinctive smell that indicates electricity in the air.

"Aha!" Gus called. "You try backing her out, Wilder."

Gus flicked off his flashlight beam. This time as the engine died Gus saw a flash of spark at the rear of the engine block.

"Try her again," he said, playing his flash on the spot.

With the next try in reverse, Gus saw the little motor twist on its mountings under the strain. With the car on a downgrade, the back end of the block tilted just enough so that the oil-gauge pipe came against one of the primary circuit connections of the coil on the fire wall, short-circuiting the ignition. Gus bent the pipe forward a couple of inches. Then he put down the hood and leaned inside to speak to Wilder.

"Don't tell that kid of yours, sailor," he said, "what a dumb mechanic you ran into down the line. You can roll now."

A big grin came over the sailor's face. He shifted into reverse. Under the guiding beam of Gus's light, the little car backed stoutly up the grade to the highway.

"Thanks a million, mister," Wilder said, leaning out, the snowflakes falling on his face. "The kid will be asleep. Think I should wake him up, or just fill his stocking and let it go until morning?"

Only Minutes to Curtain Call

"If it were me," Gus said, "I'd wake him up. A year is an awfully long time to a kid."

"You said it," Wilder remarked. He shifted gears and was gone.

Gus stood there a moment, looking after him. His coat was sprinkled with snow, giving him the look of a shaggy bear. Then he was running to his car, dousing the flares, getting under way. As the car shot forward, he glanced at the dashboard clock.

"Eight minutes," he said aloud, "to make three miles and get on that stage. Santa Claus may be a few minutes late, but *those* kids see their fathers every day." END

NEXT MONTH: Gus absolves the little green men.

Amazing New Tool! It's Complete!

Just Plug It In!

SHOPMASTER'S 8" TILTING ARBOR CIRCLE SAW

for the first time a **modern power tool** as simple to run as a **modern appliance**

with BUILT-IN MOTOR and TABLE EXTENSIONS

Features special motor that develops up to ¾ horse power torque. Has new master view indicator, finger tip control. Blade cuts 2½" depth and tilts to a full 45°. Table size with extensions is 16"x30". Comes complete with stand, saw, table extension, built-in motor, cord, mitre gauge, stop rods, rip fence, 8" Roc-edge saw blade, plastic guard. All for only $99.50.

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No V-Belts To Buy!
No Pulleys To Buy!
No Table To Build!

$99.50

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1214 S. 3rd St., Minneapolis, Minn.
Please send me complete information about the New Shopmaster Circle Saw.

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Address_____
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steel threads in wood

TEENUTS mount flush without counter-boring. Excellent for new work or repairs . . . wood to wood, wood to metal . . . and where old screw holes have worn out. Simply drill hole for TEENUT barrel, hammer home TEENUT and its steel prongs provide rigid, permanent anchorage. Same size hole for bolt. Sizes to fit standard bolts: 6-32, 8-32, 10-24, 10-32 (4 per card), ¼-20 (3 per card), 5/16-18, ⅜-16 (2 per card).

AT HARDWARE COUNTERS EVERYWHERE 15¢ per card

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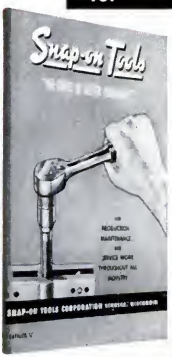

America's Foremost *money-making* **MECHANICS' TOOLS**

It's easy to own the same "pay-off" tools used and endorsed by America's top-earning mechanics throughout the automotive, aviation and industrial fields! Snap-on tools help you handle every repair job faster, easier, better. And they LAST . . . pay for themselves over and over again! Start building your own tool set now with basic Snap-on units—add others any time. Genuine Snap-on tools are never sold in stores—direct to users only. Mail coupon for free catalog.

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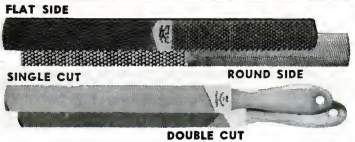

Two dandies for the handy man

Novelty and versatility go hand in hand with these multi-purpose items of the famous Nicholson and Black Diamond file brands.

4-IN-HAND (upper) is a file-rasp that gives you a choice of four different material-removing faces: Half Round file and Half Round rasp on one side, Flat file and Flat rasp on the other. For wood, metal, leather, plastics, etc.

HANDY FILE (lower) is double-cut on one side, single-cut on the other—for both roughing down and smoothing. Also wonderful for sharpening edges of many kinds of cutting tools. Forged-on handle with handy hang-up hole.

Amateur and professional craftsmen who pride themselves on a representative collection of fine tools invariably prefer Nicholson or Black Diamond when it comes to files. *Hardware dealers are equally proud to sell them.*

Two "musts" for the make-it-yourself hobbyist

ROTASET with either 18 assorted power-driven Rotary files or Ground burs (or 9 Rotary files and 9 Ground burs) in high-speed steel with ¼" shank.

ROTAKIT in similar 10-item assortments with ¼" shank.

X.F. SWISS PATTERN files—craftsmen's delight! They're Round-handle Needle files in 12 assorted shapes for fine work on small, accurate parts, dies, instruments, etc. Choice of 3 lengths and 4 degrees of cut. Handsome 2-color plastic case with bottom stand.

NICHOLSON FILE CO., 19 Acorn St., Providence 1, R. I.
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON U.S.A. NICHOLSON FILES FOR EVERY PURPOSE BLACK DIAMOND TRADE MARK

Toolmaker's Museum on Wheels

[*Continued from page 92*]

Mexico. For the last 10 years he has managed his far-flung enterprises by remote control from an office atop his Montecito mansion. He makes monthly factory visits and uses his office in the administration building in Des Plaines, Ill., three months of the year to get "reinstated with the employees as the guy who runs things."

Business Is Better With the Boss Away

"But actually I don't know what's going on when I'm there," he confides. "I'm more in touch with everything when I'm in California, with daily reports flowing in from all the factories and stores, and with time to digest them and formulate future policies. The business runs much better when I'm away from it. That's because it's human nature, when the boss is available, for department heads to drop in for confirmation on matters that should be weighed and decided in the light of specific considerations on which it is their function to be more fully informed than he."

Staying in the office may handicap the Wilkie clan more than some young executives, because they seem to be constitutionally incapable of closing their minds to suggestions.

Plastic Revealed Inner Workings

When Plexiglas first came out, and before even the manufacturer knew much about how to handle the new clear plastic or what to do with it, the Wilkie boys duplicated a DoALL bandsaw machine in the transparent material to demonstrate its inner workings. Such exhibition models are now common.

The Wilkies were also among the first to use 3-D for sales promotion, packaging slides of their entire line, with a viewer, in a miniature replica of a DoALL.

Since there are no ignorant stockholders in the Wilkie corporations to ask. "What happened to the last dividend?" the brothers have on occasion indulged

[*Continued on page 234*]

YOU CAN START A $40 A DAY BUSINESS IN YOUR SPARE TIME

Andy Phillips says: "My BELSAW Sharp Smith gives me big profits at low expense — I can run 35 to 40 circular saws in an 8-hour day — that makes me $40 cash."

"I also get BIG EXTRA PROFITS . . . up to $4 an hour . . by grinding planer and jointer knives — there's always a demand for this kind of work."

You can start this REPEAT CASH business in your own home or garage while you are working at your regular job. Easy to operate, no experience needed. "Pays for itself from just 65 jobs." — *Harvey Jensen*

For as little as $15 down payment, you can get your BELSAW SHARP SMITH rushed to you.

FREE book tells how

YOU can start making money the very day your BELSAW SHARP SMITH arrives. Earns $4 to $5 an hour in your SPARE TIME sharpening and setting circular saws for builders, lumber yards, factories...Plus BIG EXTRA CASH, precision grinding planer and jointer knives, plane irons, wood chisels and drill bits. Hundreds of jobs in your own neighborhood. No extra equipment needed, no canvassing. Send today for your Free copy of "Life-Time Security."

LIFE-TIME SECURITY YOUR OWN BUSINESS

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Whatever your hobby Model building, whittling, Indiancrafts, leather, plastics or any other creative handicraft

x-acto knives, tools & sets

designed by craftsmen and precision-made for fine craftsmanship

will help you do a better job

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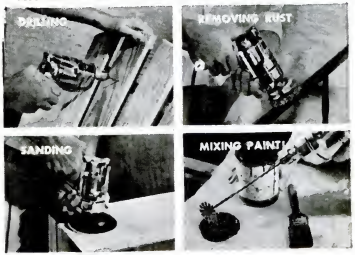
NEW from BLACK & DECKER

Christmas Tool Chest for Giving or Getting!

Here's a brand-new B&D Electric Tool Chest in a gift-carrying case. Includes ¼" drill, 7 drill bits, 3 sanding discs and backing pad, polishing bonnet, wire cup brush and paint mixer. Contains everything needed to make home jobs easy! A $34.25 value! Special Christmas price saves you $4.30! Order this B&D Chest from your dealer today!

$29.95

KIT DOES ALL THESE JOBS—AND MORE



Bob Davis says: Send 25c in coin for my *"Handy Tips"* booklet, full of ideas and hints for home jobs. Write: Bob Davis, Home Service Dept. S-124, THE BLACK & DECKER MFG. Co., Towson 4, Md.

FOR INDUSTRY, SHOP, FARM AND HOME

Black & Decker
PORTABLE ELECTRIC TOOLS

Classified Telephone Directory tells where to buy it. For nearest dealer, see "Tools-Electric."

MORE SANDING AREA

than any sander in its price class

25 square inches

only 2 15/16" high . . . fits under tight places

LOWEST SANDER DESIGN

IDEAL CHRISTMAS GIFT
only $14.95
model 700

The Newest Power Sander and Polisher on the Market

As efficient as any rotating motor-driven sander, plus these quality features: straight-line action, no bucking, sands *with* the grain and goes all the way into corners; powerful 60 cycle reciprocating motor gives 14,400 strokes per minute; exclusive insulation gives smooth, quiet operation; push-button control; 8 foot cord.

Weller SANDERS
806 Packer Street
Easton, Pa.

AVAILABLE AT HARDWARE STORES

Toolmaker's Museum on Wheels

[*Continued from page 232*]

their scientific curiosity on a heroic scale.

They dropped a tidy $350,000 in building and equipping a mill for molding powdered metals. Once they even tried to precipitate gold out of sea water, but stopped when they realized they were precipitating more gold out of their pockets than out of the ocean. This did not stop them, nevertheless, from subsidizing research on harnessing solar energy to reclaim sea water for irrigation.

Right now they have their fingers crossed as soap companies test pilot models of a new micro-processing machine that they developed which may antiquate present methods of making soap, rubber, plastic and chocolate—or may be just another item to shrug off with, "Well, we tried." END

Fast-as-Light Farmer Shows Size of Universe

A FARMER could plow a furrow from the earth to the sun in eight minutes if his tractor moved as fast as light. Continuing at that speed, he would plow through the last dust fringes of the outermost comet known in just eight hours.

So says Dr. Clarence H. Cleminshaw of Griffith Observatory, Los Angeles, who worked out these examples to illustrate the vastness of the universe.

Sticking to an eight-hour day, the farmer would have to furrow at light's speed for about 13 years before he reached the end of his field, or the nearest star, Alpha Centauri, which cannot be seen from most of the Northern Hemisphere.

The distances to stars are commonly expressed in light years, or the distance covered by light in one year. The speed of light is 186,000 miles per second and one light year is equal to nearly six trillion miles.

That part of space at which the 200-inch telescope atop Mt. Palomar in California can peer includes galaxies that are about two billion light years distant. Galaxies are so far away that they look like points of light to the naked eye, yet they consist of myriads of stars separated by much greater distances than the field plowed by the farmer as he furrowed from the earth to the nearest star.

The CHRISTMAS GIFT

that has everything any homecraftsman or hobbyist needs

FOR SCORES OF MONEY-SAVING JOBS

Perfect gift to give or receive . . . useful all year 'round. Each kit includes:

- **Weller 8250A Soldering Gun—250 watts**
- **Famous Kester Solder—general purpose spool**
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Nothing else to buy for soldering, sealing, cutting, mending joining and smoothing. Makes professional results easy.

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MODEL 8250AK

NEW WELLER GUNS AND KITS ARE AVAILABLE AT HARDWARE DEALERS

Junior

SOLDERING GUN

- **New, Compact Design**
- **Heats in 5 Seconds**
- **Over 100 Watts**
- **Trigger Switch Control**
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The ideal homecrafters' soldering tool. No other soldering gun or iron offers the professional quality, practical features and low price of the Weller JUNIOR.

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ELECTRIC CORPORATION

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SOLDERING GUNS • SOLDERING KITS • POWER SANDERS

Piston rings wear out, too!

You can't see the wear on your piston rings. But you can feel it—in your engine's loss of power—and in your pocketbook.

At the first symptom of power drop-off or oil-pumping, you should go to your motor specialist for a ring check-up.

Wasted oil costs money. Needless repairs cost more. Both can be avoided by replacing the piston rings at the first symptom of ring wear.

Hastings rings are especially designed for *replacement* service. They deliver the lubrication that older motors must have—but always with complete oil control.

Don't gamble with the power that is built into your engine. Restore it, keep it, enjoy it.

If your motor specialist recommends new rings, ask him to install a Hastings Steel-Vent replacement set. Truly the best money you can spend on your car!

HASTINGS MANUFACTURING CO. • HASTINGS, MICHIGAN
HASTINGS LTD., TORONTO
Piston Rings, Casite, Oil Filters, Spark Plugs

HASTINGS
STEEL-VENT PISTON RINGS
Regular or Chrome

TOUGH on Oil-Pumping
GENTLE on Cylinder walls

Mercury Grows Faster and Sleeker

[*Continued from page 128*]

ble torque at the low end of the speed range without hurting at the upper end. The fuel pump is inverted, and larger; the manifold heat valve is changed to fit the new exhaust system; and there is better exhaust-valve cooling.

Not thirsty. The big engine doesn't promise to swill down gas, provided you don't get carried away by the delights of lead-footing it. For one thing, rear-axle ratios have been tailored to suit (3.15 in place of 3.54 in the automatic, for instance, and 3.73 in place of 3.92 in the manual-shift car).

In the gearbox department, you have a pick of manual shift, automatic, or overdrive. The automatic, in common with that in the new Ford, Lincoln, and Thunderbird (Oct., p. 131), has a cute gimmick: a throttle-triggered automatic downshift to low for show-off getaway. Total torque multiplication at stall, with the accelerator on the floor, is 5.12-to-1, which is ample to screech the tires, flex the passengers' heads backward, and sensitize any cop within 100 yards.

More practically, the automatic has noticeably "smoothened-up" shifts. If you are whistling along in Drive at 50 m.p.h., and suddenly come to a brisk downgrade, you can calmly pull the lever to Low for extra hold-back. At this speed the transmission goes to intermediate, not low (changing from a 1-to-1 to a 1.46-to-1 ratio) and gives you considerable but not convulsive retardation. Then, if your speed subsequently drops to around 24 m.p.h., the box steps down to low (2.4-to-1). Once there, it won't upshift, however steep the grade, until you reset the lever. Neither shift produces a major commotion—they're of about the same magnitude as a power kickdown.

In summary, then: the vintage looks promising for 1955.—*Frank Rowsome Jr.*

Interesting Sign Department

On a California highway: "This community puts its foot down on drivers who do likewise." —*Public Safety.*

NO FINER *Gift* FOR MAN OR BOY

Give a gift he can use with pleasure and profit . . . on the job or in his hobby . . . dependable, accurate STARRETT TOOLS.

Starrett TOOLS

No. 530 Case Tape — 50′
No. 500 Pocket Tape — 60″

Combination Squares
Sizes from 4″ to 24″

Satin Chrome Micrometers
No. 230F — Friction Thimble
No. 436 — Ratchet Stop

No. 220 MUL-T-ANVIL
Micrometer Caliper

No. 153 Pistol Grip
Hacksaw Frame

No. 815 Toolmaker's Hammer
Polished Chrome Finish

Starrett Book For
Student Machinists

No. 1010 Dial-Indicator
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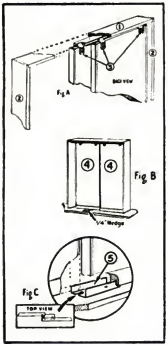

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2. Place roller carriers (3) in grooves of overhead track in header (1).
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A Net to Catch the Northern Lights

[Continued from page 103]

Sydney Chapman of the University of Oxford and Dr. D. F. Martyn of Canberra, Australia.

The Chapman-Martyn theory holds that during sunspots, solar flares, and perhaps other solar disturbances, quantities of the sun's gases hurtle outward in great jetlike streams, much as water is propelled from a garden-hose nozzle. These streams are composed chiefly of hydrogen atoms, the simplest of all atoms; each consists of one proton carrying a positive electric charge and one negatively charged electron.

From time to time, as it travels in its orbit around the sun at a speed of 18 miles per second, the earth is bombarded by one of these atomic streams. Then auroras glow, compass needles dance, and long-distance communications circuits break down. But the stream of atoms from the sun does not enter the earth's atmosphere directly, for the earth is protected by a magnetic "shield" which acts as a barrier deflecting the incoming solar atoms. When the incoming stream hits this shield, at a height of many thousands of miles above the equator, it divides into two streams and flows around the shield—much as a stream of water flows around a rock or other obstacle in its path. Positively charged particles go around the equator in one direction and negatively charged particles in the other. A doughnut-shaped "ring current" of particles is thus built up, circling the equator, thousands of miles up.

Auroral Current Circles the Globe

Once the particles enter the ring current, they continue to travel around and around the earth in it, perhaps for days. From time to time, however, particles leak out of the ring, so that the current gradually "decays." It is these particles leaving the ring which chiefly explain radio blackouts and other communications vagaries.

Careful calculations show that the

[Continued on page 240]

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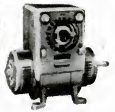

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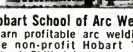

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A Net to Catch the Northern Lights

[*Continued from page 238*]

magnetic lines of force above the equator inevitably guide the escaping auroral particles toward the earth, usually in the vicinity of the auroral zones. There the particles collide with the nitrogen and oxygen atoms in the atmosphere—and the energy of the collisions produces the auroral glow.

A fine theory, you may say—but is it true? Credit for confirming important parts of the theory goes primarily to Dr. A. B. Meinel and his associates at the University of Chicago's Yerkes Observatory in Williams Bay, Wisconsin. Dr. Carl W. Gartlein of Cornell University achieved similar results with his National Geographical Society spectrograph.

Dr. Meinel took a small airtight chamber filled with ordinary Wisconsin air from which the dust and moisture had been filtered, and then pumped most of the air out of the chamber so that what remained was as thin or "rarefied" as air at a height of 60 miles or more, where the aurora glows. He then bombarded this rarefied air with a thin beam of positively charged hydrogen particles. The air in the chamber glowed—and study of this glow with a spectrograph showed that it was quite similar to the glow of the quiet arc-type aurora.

But something was missing from the artificial glow. Hence, Dr. Meinel and his associate Dr. C. Y. Fan repeated the experiment, but this time they bombarded the rarefied air with positively charged particles of helium—the second most common element on the sun. Sure enough, bands of light missing from the previous glow appeared.

Scientists' "Net" May Pick Up New Facts

Scientists now believe that study of the aurora may tell us the answers to such questions as how far upward our atmosphere extends, what gases it contains at various heights and how its temperature varies from level to level. It is to secure answers to these and many similar questions that auroral studies will be in-

[*Continued on page 242*]

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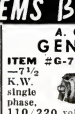

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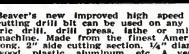

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A Net to Catch the Northern Lights

[Continued from page 240]

tensively pursued from now through the next peak of auroral activity, 1957-58. That is also the period of the International Geophysical Year (IGY).

One feature of the auroral net will be a string of observation posts circling both the north and south geomagnetic poles. There also will be a pair of stations, one at College, Alaska, and the other on MacQuarrie Island in the Antarctic, located on a single "magnetic line of force." Simultaneous observations at both ends of this magnetic line will determine the difference, if any, in the paths of the auroral particles as they travel northward and southward from the equatorial ring.

Rockoons Will Aid in Research

Plans call also for the use of powerful Aerobee rockets, capable of climbing right up into an aurora; 25 Aerobees carrying instruments for auroral study and other research projects will be launched from Churchill, Canada; and another 11 from Alamogordo, New Mexico. Thirty-seven "rockoons"—small balloons which rise up into the stratosphere and there release rockets capable of carrying instruments higher still—will be launched in Canada, Alaska and Greenland. Other nations in the IGY are planning similar rocket researches.

At Cornell University and at the University of Alaska, trios of radio telescopes will be aimed *through* the Northern Lights at distant stars. The purpose is to determine how radio waves emitted by these stars are affected as they pass through an aurora. Perhaps some kinds of waves will be found which can penetrate an aurora without difficulty; such waves might prove useful for Arctic communications or for radar work.

Visual observations of auroras in the United States and Alaska will be concentrated at 30 stations equipped with special filters which admit auroral light but block out light of other kinds, thus increasing the accuracy of auroral observa-

[Continued on page 244]

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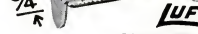

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A Net to Catch the Northern Lights

[Continued from page 242]

tions. An additional 70 portable filters of this kind will be lent to scientific volunteers—especially airplane pilots flying over unfrequented portions of the earth's surface, and amateur scientists in the northern United States and in Alaska.

Research Will Cover Weather Theories

Scientists of the nations cooperating during the IGY will seek, among many other objectives, to prove or disprove the theory that meteorological disturbances in the far Antarctic profoundly modify the weather here in the Northern Hemisphere. They will seek to determine whether the continents are in fact stationary, or are slowly drifting farther apart or closer together. Glaciers and polar ice caps will be measured to see how much they have melted since the last checkup in 1932-33; preliminary evidence suggests that the ice caps are melting fast enough to make the Arctic Ocean navigable within another 25 or 50 years. Enough water is held captive in these ice caps to raise the level of the world's oceans by a hundred feet or more; and geophysicists are naturally curious to know how soon, if present melting continues, the rising oceans can be expected to inundate low-lying coastal areas and great seaboard cities. These and other IGY projects will no doubt make headlines for years to come—but few IGY discoveries will be awaited by scientists with more eager interest than the news of what is being caught in the IGY net spread to catch the aurora. THE END

Do Porpoises Use Sonar?

PORPOISES may use sonar to navigate and to hunt for fish for food, say scientists of Florida State University. A dozen of the seagoing animals were tested in a pool and found to respond to underwater sounds of extremely high pitch—50,000 cycles and more (humans can't hear beyond 20,000). This discovery, coupled with the fact that the porpoise's brain has an unusually large section devoted to hearing, suggests that the porpoise sends out ultrasonic pulses, then listens for the echo in order to locate fish and other obstacles in its path.

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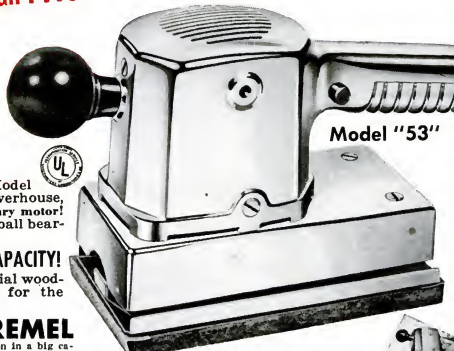


SENSATIONAL NEW SANDER!

The DREMEL Model "53" is a real powerhouse, driven by a real **rotary motor!** Has lifetime sealed ball bearings.

HEAVY DUTY CAPACITY!

Built for the industrial woodworker yet priced for the handyman!

ONLY DREMEL

offers you straight-line action in a big capacity, motor-powered sander. That's why the "53" is the choice of craftsmen in home and industry. The "53" has a big 24 sq. in sanding pad, yet weighs but 5¾ lbs. Delivers 6,900 strokes per minute. Has no gears, belts, brushes or commutator to wear out. Use it for WET or DRY, coarse, medium or fine sanding. You'll get results impossible with other sanders costing many dollars more!

$34.85

complete with: two sanding pads and six assorted abrasives. Extra pads, $2.75.

EXCLUSIVE!

DREMEL Model "53" has a quick-action detachable sanding pad. Extra pad furnished free.

Easy on! Easy off! Only DREMEL has it!

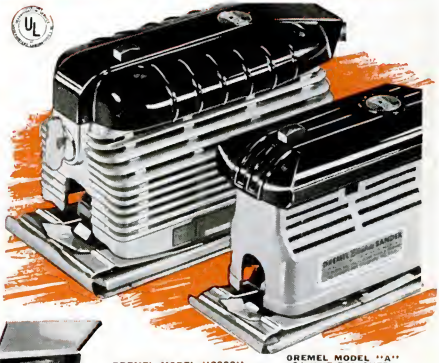
Hobbyists . . . Craftsmen . . . Housewives . . . All Need a DREMEL Sander!

Did you know there are 4 different sanding actions? When choosing a power sander—it's the type of action that counts. To do the job right, you must sand with-the-wood grain. Sanding across-the-grain with a circular or orbital motion leaves scratches and swirl marks which show up after varnishing. Always remember—only DREMEL STRAIGHT-LINE ACTION will sand with-the-grain.

Proof that DREMEL Action Can't Scratch!

Of the four common sanding actions, only DREMEL sands 100% **with-the-grain**—the only guaranteed scratch-free action approved by finishing experts.

ROTARY (cross-grain) Action	ORBITAL (cross-grain) Action	ARC (cross-grain) Action	DREMEL STRAIGHT-LINE (with-the-grain) Action



DREMEL MODEL "2000" SANDER-POLISHER

Perfect for small shop use, home repair and workshop projects. Choice of craftsmen for fine finishing operations. Features Dremel "Straight-Line Action"; 14,400 strokes per min.; 5 lb. wt., 21 sq. in. (3⅛"x7") sanding surface. **Model "2000" Sander-Polisher, 25 asst'd. abrasives, 1 polish pad in sturdy steel carrying case . . .** **$24.50**

DREMEL MODEL "A" SANDER-POLISHER-MASSAGER

Lighter capacity model, a favorite for general home maintenance, hobbycraft, furniture polishing, etc. Effective body massager. Features Dremel "Straight-Line Action." Wt. 2½ lbs.; 12 sq. in. (2⅜"x5⅜") sanding surface. **Model "A" Sander-Polisher-Massager, 6 abrasives, 1 polish pad, 1 massage pad . . . . . .** **$14.85**

SEE YOUR FAVORITE DEALER: Dremel Tools are sold at better dealers everywhere! If your dealer can't supply, order direct on a five-day trial, money-back guarantee. Remit in full, and we will ship postpaid. Or, send only $2.00 now, pay postman balance plus postage and C.O.D. fee.

DREMEL MANUFACTURING COMPANY, Dept. 124-M, Racine, Wisconsin

Gift Ideas for XMAS

Aladdin ¼" POWER DRILL TOOL ATTACHMENTS

POWER PLANER

SAVES TIME AND WORK ON MANY JOBS

Ideal for fitting doors, screens, storm windows; smoothing rough edges of lumber; handy in cabinet work. Planes wood up to 2" wide.

Exclusive Attaching Feature gives perfect alignment and holds planer and drill firmly together. Changes on and off quickly. Extra tough, heat-treated spiral rotary cutter 2" wide —cutting depth adjustable. Long wearing sealed gears. Strong alloy die cast frame. A tool you'll enjoy and appreciate. **SANDING ATTACHMENT** for Planer and 2 sanding drums, **$1.00** extra.

$12.95 Postpaid

3-IN-1 SAW **A Hack Saw, Jig Saw and Coping Saw** in one easy to use attachment. Cuts metal, wood, plastic, hardboard, etc. Full 9/16" chip clearance. No gears, no bearings to wear out. Ideal for sawing in hard-to-reach places. Weighs only 11 oz.

$4.95 With metal and wood blades (1 ea.). Postpaid

4-HOLE SAW **Cut 4 Sizes of Holes**

Quickly, Perfectly With One Tool

A circular saw blade for each size hole—1", 1½", 2", 2½" diameter, blades slip into grooves of alloy saw body and are firmly held by set screw. A ⅛" drill bit anchored in saw body guides saw blades and prevents tool from "Jumping." High carbon steel blades cut wood, plastic and metals.

Complete with 4 saw blades (8 or 14 tooth) and ⅛" drill bit—Specify for wood or metal cutting when ordering. Postpaid.

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Every Aladdin Attachment Tool GUARANTEED SATISFACTORY or Money Back. Will ship C.O.D. plus postage. Literature available on all attachments. DEALER INQUIRIES INVITED.

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SURPLUS! NEW Gov. Release!
Original Govt. Cost $350.00
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$129.00 f.o.b. Fully Guaranteed

5.3 C.F.M. **200 lb. PRESSURE**

Maintains 40 to 65 lb. pressure for CONTINUOUS spraying (no waiting 'til tank keeps building up)

Made by **Bendix Westinghouse** to rigid specifications. A **Buy** for Contractor; Factory; Garage; Service Station; Shop; **Farm!** *PORTABLE!* Two independent air outlets—one for high pressure (up to 200 lbs.)—the other controlled by regulator from 0 to max. Large face gauge. Adjustable Safety valve. Automatic unloader (adjustable up to 200 lbs.) keeps pressure constant without stopping engine. Welded hollow frame acts as air reservoir . . . assuring large supply of **Oil-Free** air with **Absolutely No Pulsation! Greasing; Tire Inflation; Blowing out heating and refrigeration lines; Small pneumatic tool operation; Insecticide dusting and spraying; Flocking; Undercoating! Specifications below:**

—COMPRESSOR—
- **Mfg. by BENDIX WESTINGHOUSE**
- **Twin cylinder**
- **4 Rings on each piston for added compression capable of pumping 200 lbs. p.s.i.**
- **Forced pressure lubrication assures oil to every moving part**
- **Ball bearing construction**
- **Capacity 5.3 cu. ft.**

—ENGINE—
- **Mfg. by BRIGGS & STRATTON**
- **Kick or rope start**
- **2 H.P., 4-cycle air-cooled**
- **Splash lubrication system**
- **2-qt. gas tank**
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- **3 Piston rings**

ALSO AVAILABLE! Same unit with 1 H.P. Electric Motor. Single-phase. 110-220 volts. 60 cy **$129.00**

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ROBERTS ELECTRIC CO., Dept. S-242, 849 W. Grand, Chicago 22, Ill.

These Cars Made a Hit in Disguise

[*Continued from page 134*]

vere trials under cover of 1954 bodies.

Stop-and-go experiments on mountain grades near Asheville, N.C., had tested the mettle of '55 axles and transmissions. Speed and temperature trials had been made on sizzling, floor-flat desert roads near Brownsville, Tex. Pike's Peak had challenged Dodge and DeSoto hill-climbing powers and brakes, had demonstrated altitude effect and vapor-lock conditions.

The most-discussed change on the 1955 models came about almost by accident.

Stylist's Idea Made Engineers Happy

Many months ago, in the course of creating a clay instrument panel for a full-scale mock-up of the proposed 1955 Chrysler, Cliff C. Voss, head of Chrysler's styling studio, had the sudden urge to see how the automatic-transmission selector would look on the dash instead of the steering post. It looked so good there that the chassis people were asked to find out whether or not the change was practical. They happily reported that the linkage would be simpler and less expensive than before.

To show the top brass, Virgil M. Exner, Chrysler's director of styling, had a sample mechanism put in a 1954 Chrysler.

The new arrangement was an instant hit on the loftiest of corporation levels, and the order went out to make the change in the whole darned family of cars—Imperial, Chrysler, DeSoto, Dodge and Plymouth—for 1955. END

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NEXT MONTH in Popular Science Monthly

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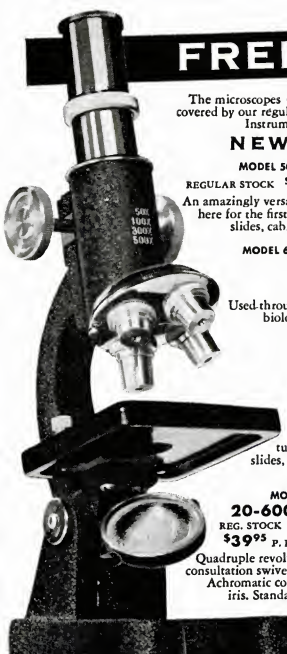

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REGULAR STOCK $19.95 P.P. FREIGHT SPECIAL $11.80 P.P.

An amazingly versatile instrument with four objective lenses offered here for the first time. Shipped ready to use with slides, cabinet, manual.

MODEL 635 150-300-600 POWER

REGULAR STOCK $29.95 POSTPAID — FREIGHT SPECIAL $19.50 POSTPAID

Used throughout the country by schools, colleges, biologists and hobbyists. Shipped with slides, cabinet, manual.

MODEL 300 100-200-300 POWER

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This microscope can show you microscopic animal life. Triple revolving turret. A wonderful gift. Complete with slides, cabinet, manual.

MODEL 800 20-600 POWER

REG. STOCK $39.95 P.P. — FREIGHT SPECIAL $29.50 P.P.

Quadruple revolving turret. Prismatic consultation swivel head (360 degrees). Achromatic condenser, iris. Standard optics throughout. A fine professional instrument. With slides, cabinet, manual.

Mechanical Stages — Available for models 635, 800 and Von Steuben — $14.95 postpaid

WONDERFUL SUBJECTS ABOUND IN YOUR OWN HOME.

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Cabinets — All microscopes are shipped insured in fitted hardwood cabinets.

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FREE Micro-manual mentioned above. Shipped on request or included with order.

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[*Continued from page 122*]

joint suspension has been tilted some three degrees to the rear.

Plymouth, while staying with 10-inch brakes on six-cylinder models, has gone to 11-inch drums on the front wheels of V-8s, and 11-inchers all around on station wagons. The new frame provides a big 2.56-inch increase in front-wheel tread, to help stability and cornering. There's a new steering linkage and gear that, sadly, costs some increase in overall steering ratios. Plymouth has new shock-absorber locations, more body mounts, and rear springs that are 25 percent wider than last year's.

Chevrolet, having already had 11-inch drums, makes only touch-up brake changes, aside from adopting a suspended pedal. Like Plymouth, its front-wheel tread is also wider, by 1.3 inches. In a major change, it has gone to ball-joint front suspension, which eliminates the troublesome kingpin and greatly reduces the number of grease points. (Chevvy prefers to call it "spherical joint," at least until the tongue slips.)

They've added a neat wrinkle: On a hard stop, braking torque from the front wheels is led into the suspension in such a manner as to counteract the tendency of the car to dive. The result is most apparent in those trafficky situations where sudden braking can make some cars bow like circus horses. Chevvy still dips, but much less.

Engineers' enthusiasms. Some features in particular seem to please the engineers at each company. Ford people, for instance, like to mention an improved cooling system, with a higher-capacity pump and a new 14-pound pressure cap that won't "hunt" between atmospheric and rated pressures. They're confident they've licked some 1954 headaches, notably camshaft metallurgy and oil gaskets. They suspect that the modified automatic transmission—like Thunderbird, Merc and Lincoln, it has a new getaway kickdown for showy, two-shift starts—may give an edge in the stop-light steeplechase.

[*Continued on page 250*]

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SURVEYORS LEVELS—TRANSITS

- Leading make precision level suitable for leveling, contouring, building construction, etc. Fine for builders, farmers, etc.
- Complete with 2-Sec. 9' rod, case, instructions. A great buy! **SPECIAL**, Prepaid..... **$37.95**
- **Level-Transit.** Combination unit suitable for either leveling or lining up. Finest scope, etc. With 9' rod. **SPECIAL**, Prepaid..... **$77.50**

ARMY FIRST-AID CHEST

- Complete set of first-aid essentials. Everything for cuts, burns, bruises, bleeding, etc. Full instructions.
- Attractive 10 x 10 x 3 -in. metal chest. Can be mounted on wall, in car, etc. Every home and business should have one. Cost over $12. **SPECIAL**, Prepaid..... **$6.95**

NEW DELUXE ARMY TOOL CHEST 28" x 38" x 20"

- Wonderful unit. Finest cabinet design. Four lift-out drawers, excellent hardware, etc.
- Ideal for home shops, contractors, tool rooms, etc. Govt. cost, $59.60. Sale **$21.95**

HYDRAULIC SPEED REDUCER

- Amazing Gov't. Speed Reducer unit. Consists of hydraulic pump and motor. Output speed range 0 to 1000 r.p.m. Drive with any AC motor.
- Useful for hand saw drives, miniature auto drives, etc. Gov't cost, $429.50. **SPECIAL**, Prepaid **$33.95.**

HYDRAULIC BARGAINS

- **Cylinders.** Two-way, 2"x10", **$22.85**; 2"x24", **$28.90**; 3"x24", **$39.90**. One-way, 2½"x42", **$36.95.**
- **Pump.** 1000 lb. 12-gal. **$48**; Valves. One-way **$18**; two-way **$18**; Gauges. 1000, 1500 or 3000 lb. **$3.49.**
- **Super Special.** Cylinder, 1½" bore x 4" stroke. (Precision). Gov't cost $87. **SALE** ..... **$1.95** ea.

ARMY PARTS CLEANER

- Air-turbo solvent cleaner. Makes dirty, greasy parts shiny bright. Wonderful for garages, factories, farms, etc.
- Heavy galv. tank 25"x20" x20". Complete with valve, hose, hydraulic lid lifter. Cost over $125 . . . Prepaid **$29.95**

GIANT LIGHT 110V. 60C

- Amazing 110-Volt unit with intensifier fresnel. Throws wide beam over large area. Wonderful for parking lots, advertising lite, small airports, etc. Comes in $30 trunk with extra bulbs, 12 ft. extension tripod, anchors, etc. Govt. cost over $200. Sale—Prepaid **$49.50**

ARMY AUTOMOTIVE TESTER

- Another four-star buy! Designed for electrical testing of both 6 and 12 volt electrical systems. Fine design, leading make.
- Tests starters, generators, wiring, relays, coils, batteries, etc. Has ohmmeter, voltmeter, current scale. Two separate meters. Many other features. Used, excellent. Cost $71.50. **SALE**, Prepaid, **$14.67**

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For painting, cleaning, tires, control termites. Assemble your own outfit. Lowest prices in U. S.

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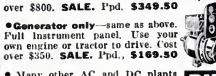

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- Can also be used as remote Servo using pair of cylinders—one as transmitter, other as receiver. Gov't cost $87.50 ea. **SALE** ..... Prepaid, **$3.89** each **$6.39** pair

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- War's most amazing invention using pair of units, mechanical motion can be transmitted over wires. Makes fascinating wind direction indicators, antenna rotational controls, burglar alarm, depth recorders, etc. Live 60-c units. Gov't cost $125 pr. **SALE** Pair ..... **$12.97** pr.

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Irrigate. Do it yourself. Our data shows you how. ● Pumps, Centrifugal 3/4" **$19.95**; 1½" **$38.60**; Rubber impeller self priming 1½" **$15**; Hi-pressure rotary for weed, cattle spraying **$54**; ● **Water System**, Automatic. For lifts to 23 ft. 500 gal. per hr. 40 lbs. 110-V 60-C, ¼ hp. motor **$69.50**

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- Amazing electro magnetic switch. Complete with dial. Any circuit from 1 to 100 can be selected simply by dialing the number, uncanny response. Will work over lines up to 20 miles. Used, excellent.
- Fine for inter-coms. Private automatic phone systems, remote control experiments, etc. New Cost Over $200. Sale **$13.95** Prepaid

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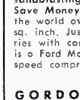

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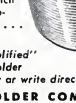

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[Continued from page 248]

At Plymouth the enthusiasms are general. This might be expected: Until now, Plymouths have been chiefly noted for homely virtues. Apart from the new looks and engines, there is an evident appreciation of the car's mechanical accessibility, and of the new fire-wall mounting for the heating system, which unclutters the engine room. The body has a good deal of beefing up and sealing.

Chevrolet people are still somewhat dazed at the size of their changes, which involved redrawing nearly 95 percent of the car's blueprints. Among their special prides are the weight-paring program, especially on the engine, and the new 12-volt electrical system, the first in the field. They also feel they're onto something with a heater design where the plenum chamber measurably beefs up car structure—a first step toward integral body-frame construction. They've got a new recirculating-ball steering gear, a new generator-mounted power-steering pump, and new over-all ratios—25.7:1 manual and 23.1 power. The rear springs, to take back-torque, are 9 in. larger.

How do they go? Each of the three is pleasant to drive, and, at the top horsepowers, distinctly invigorating. With the standard engines the cars are somewhat friskier than last year's versions but are in no sense bombs. It must be remembered that acceleration and top speed are out at the end of a mathematical lever—that it takes a whale of a lot more power to give a car a little more poop.

As for the glittering trim, the pastel paints, the vinyl boudoirs, and the low, low look, don't be too quick to say you wouldn't have it in the driveway. Especially after the lady gets a look. END

Still Hopeful

The announcement that nuclear fission is being used for medical research makes us hopeful that splitting the atom may turn out to have been a wise crack after all.—*Wall Street Journal.*

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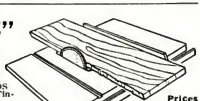

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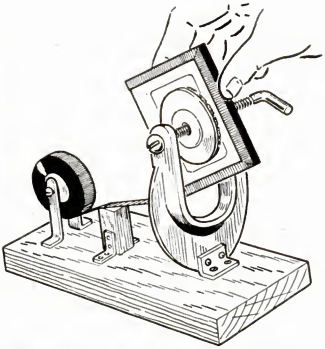

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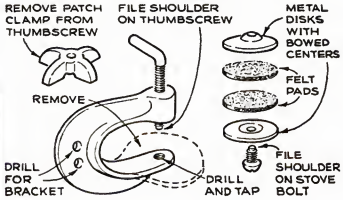

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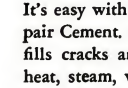

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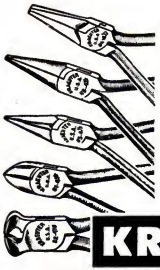

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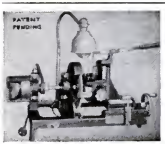

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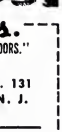

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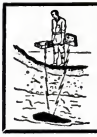

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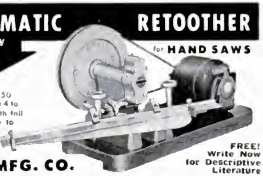

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3 SHOT REPEATER SHOTGUN

CHOICE OF 12 or 16 GAUGE

Here is a truly fine gun at a REMARKABLE PRICE. Only through a terrific Bankrupt Buy can we offer you this value. Has a skillfully engineered, tested steel barrel with a full tapered choke . . . GREATER POWER and ACCURACY. Stock is beautifully grained walnut, complete with RUBBER RECOIL PAD. Bolt Action plus many other quality features. . . . . .

BOLT ACTION

NEW

AND THAT'S NOT ALL

This amazing Shotgun Bargain comes to you packaged in a handy gift carton containing: 5 Pc. RAMROD SET, complete CLEANING KIT, GUN OIL, PATCHES, GUN SLICK, NITRO SOLVENT, and a METAL PARTS KIT. All at this special price

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Made in Belgium for famous Hy-Score. No pumping necessary — just cock and fire. Has ALL-STEEL, fully rifled barrel, 17½" long. A beautiful, natural finished hardwood stock. Shoots .22 cal. Pellets or Darts. An excellent training rifle. Ideal for indoor or outdoor use. Wt. 5 lbs. Length 40½".

1800 VALUE

10.95 SAVE 8.85

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Made for Armed Services by the countries leading bat mfgr. These are regulation size, rugged, straight grain hardwood—made to take it! Available in either hardball or softball bats. Weight 3 lbs. Please include postage.

1.29 EA.

AN-6530 AVIATORS GOGGLES

Rubber covered metal frames, lined with a soft chamois. Has built-in breathers to keep lenses clear. Your choice of interchangeable lenses in clear, amber or green. A $5.00 value . .

2.89

EXTRA LENSES—Choice of colors listed above. Price per pair **1.00**

SURPLUS WIRE SCREEN CLOTH

RUST PROOF

Super fine quality at LESS THAN MFGR'S COST. Ideal for fine strainer work. Absolutely insect proof. Quantities limited.

BRONZE CLOTH SCREEN
32 mesh, .007 gauge, 42" wide. Minimum order 10 lineal feet.

Per lineal ft. (3½ sq. ft.) Value 65¢ ft. **29¢** ft.—100 lineal ft. roll **$27.50**

200 PSI OIL PRESSURE GAUGE

Made by Marshalltown Mfg. Reads 0 to 200 PSI. Has a 3-1/2" white face. Has 28" hose with fittings. Steel case.

2.95

100 PSI STEAM PRESSURE GAUGE

New Ashcroft gauge. Reads from 0 to 100 lbs. of steam pressure in 1 lb. increments. 9¾" face. Rear mounting plate with 1/4" holes. 1/8" standard pipe port. . . .

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ARMY PICKMATTOCK

Small, easy to use has 12" steel head with mattock one side pick on other. Has hardwood handle & case.

1.29

PORTABLE SHOVEL

New G.I. Surplus. 20½" hardwood handle. Blade folds to form pick. Carry in car for emergency in snow or mud.

NEW **1.29**

BOLO KNIFE AND CASE

Made of top quality steel, 15½" long. Ideal for clearing brush, etc. Comes complete with sturdy belt sheath. . . .

1.98

NEW 1/4 TON HOIST

$10 VALUE **28.75** WITHOUT MOUNT

Ideal for Machine Shops, Garages, Trucks, Jeeps, Boats, Boat Yards, etc. Hoist has a 2500 lb. lift capacity through a 24 to 1 gear ratio. Has a bronze worm gear drive. Complete with 15 ft. of 3/16" high tensile, steel cable. NEW!

HOIST WITH CLUTCH
Same as above but has special free-spool, pull-out clutch.

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HOIST MOUNT FRAME
Specially designed and engineered for use with above hoists. Universal type mount.

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FUEL PRESSURE GAUGE
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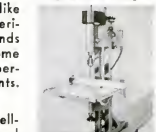

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How Much Did You Learn?

By Stanford E. Taylor and Helen Frackenpohl
Washington Square Reading Center, New York

Now you can sample how much you remember of the useful and interesting information packed into this issue of POPULAR SCIENCE MONTHLY. Answers to the questions are printed just below the quiz. After each answer is a page reference to the article on which the question was based.

1. ***One thing '55 Ford, Plymouth and Chevrolet V-8s have in common is***
   a. more power than luxury cars of 1950
   b. more power for size than other V-8s
   c. optional 200 hp. "power packages"

2. ***Tool man Leighton Wilkie believes most human achievements stem from***
   a. the wheel
   b. the primitive fist ax
   c. the eolith

3. ***The Somascope is a new***
   a. radio telescope
   b. electron microscope
   c. soft-tissue X-ray device

4. ***Churches are beginning to have a "new look"; modern architecture is used in***
   a. one out of 20
   b. one out of 10
   c. one out of four

5. ***The new "plank-and-beam" construction is cheap and fast, but it***
   a. can bear less over-all load
   b. creates insulation and wiring problems
   c. restricts size and type of house

6. ***Both high and low beams of new auto lamps are brighter because of***
   a. better reflectors
   b. higher wattage
   c. better lenses

7. ***An Army study of cold reveals that you can keep warm by***
   a. drinking alcoholic beverages
   b. eating ice cream
   c. drinking hot coffee

8. ***Of 16 V-8 engines, 11 are new since***
   a. 1952
   b. 1944
   c. 1936

9. ***The Northern Lights have helped radio hams, who improve reception by aiming their antennas***
   a. diagonally away from the Lights
   b. straight at the Lights
   c. 10 degrees east of the Lights

10. ***Rockoons, balloon-fired rockets, can send research mechanisms up to***
    a. 150 miles
    b. 70 miles
    c. 50 miles

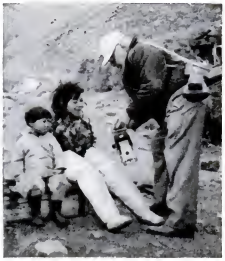
Answers: 1. a—p. 117; 2. b—p. 88; 3. c—p. 78; 4. c—p. 112; 5. b—p. 153; 6. b—p. 94; 7. b—p. 105; 8. a—p. 123; 9. b—p. 100; 10. b—p. 114.

NEXT MONTH: EXCLUSIVE FIRSTHAND REPORT ON...

The Ships That Prowl in Polar Seas

Reporter Herbert O. Johansen

A POPULAR SCIENCE reporter and photographer returned recently from a month's exploration of the Arctic by sea and air. The first of their exciting reports on that frozen frontier between Russia and America—the story of our rugged little icebreakers, illustrated with full-color photos—will appear in the January issue.



Photographer W. W. Morris

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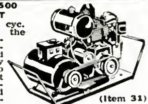
SAVE MIDDLEMAN PROFITS

GIANT 2000-2500 WATT PLANT



(Item 31)

110-120 v. 60 cyc. AC. absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb.
Reg. price $585. Special at..... **$299.50**
Same plant with electric self starter (Item 31a).......... **$359.50**
Generator only and control box....$169.50
DUAL VOLTAGE 110-220 available on any of above models for $28.00 additional.
3000-3500 WATT PLANT (Item 198) 110-220 v. 60 cyc. AC Belt Drive. Wis. engine **Push Button Start**. Wt. 370 lbs. Heavy duty **$439.50**
GENERATOR ONLY for belt drive..**$239.50**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM).

8" Fan, wt. 5 lb..................**$6.85**
9" Fan, wt. 6 lb..................**$7.85**
10" Fan, wt. 7 lb..................**$8.85**
12" Fan, wt. 8 lb..................**$9.85**

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E)..................**$11.95**
12" Fan. wt. 10 lbs. (Item 10D)....**$12.95**

CONDITIONAIRE BARN FANS

Save big money installing your own barn ventilating fan. Efficient propellor type blade moves huge volume of air quietly and effortlessly. Heavy welded frame — predrilled for easy installation. Just cut opening and bolt in place. **Continuous duty motors.** Ideal for keeping barns and chicken houses dry and ventilated. Control manually or with thermostat.

Blade	Opening	CFM	Wt.	Item	
16"	18¼"	2925	19 lb.	365a	$27.95
18"	19¼"	3600	27 lb.	365b	$31.95
20"	21¼"	4100	30 lb.	365c	$39.95

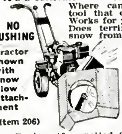
THERMOSTATS: BARN type (range 40°-60°). Wt. 2 lbs. **$6.95.**

MASTER GARDENER

SELF-PROPELLED

It's a snow-blower **It's a rotary mower**
It's a power sickle **It's a rotary tiller**
It's a cultivator **It's a plow**

NO PUSHING



Tractor shown with Snow Blow Attachment

(Item 206)

Where can you get a power tool that does so many jobs? Works for you the year 'round. Does terrific job of cleaning snow from walks, drives, etc. without backbreaking work. Also prepares deep mellow seed beds, cuts weeds, lawns, etc. The Master Gardener performs better — does more than tractors costing twice as much. Converts in minutes to Tiller, Power Sickle, etc. Basic self-propelled 2 hp tractor. Briggs or Clinton engine. **$119.50**

Snow Blow...**$39.50** Rotary Tiller.**$42.50**
Cultivator ....**$8.75** Disc Harrow..**$15.75**
Furrowing Tool **$8.75** Plow **$15.00**
Rotary Lawn Mower..............**$42.50**
Sickle Bar Mower...............**$42.50**
Lawn Mower Hitch................**$4.50**
Freight prepaid. Easy payment plan available.

EXTENSION CORD

Very flexible and tough. Neoprene #16-2 extension cord, complete with plug & outlet. 100 ft. combination. (2-40 ft. and 1-20 ft.) Item 17n. Special **$6.45**

NEOPRENE CABLE #14-2 (Item 185) Heavy duty, very flexible, 20 year quality. Wt. 9 lbs. 100 ft. Complete with rubber plug and outlet. *A terrific buy at only*...... **$8.95**

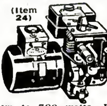
NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) wt. 8 lbs. **$6.95.** 100 ft. (Item 200)........**$12.95**

No. 10-2 POWER CABLE. Heavy duty, very flexible, rubber covered, 50 ft. with male plug and terminals. (Item 592a).........**$10.45**
50 ft. without fittings (Item 592).. **$9.95**

get **BEDROCK** factory prices from **MASTER MECHANIC**

600-700 WATTS
PUSH BUTTON START

(Item 24)

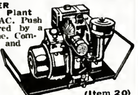


115 v. 60 cyc. AC Powered by a rugged 2 HP easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24.) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. $275 value..... **$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output....... **$199.50**

LITTLE GIANT—350 WATT (Item 273) 115 v. DC 1½ hp. Briggs engine. Perfect for lights, radios, chain saws and power tools. Wt. 65 lbs........... **$99.75**

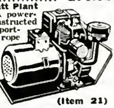
PORTO-POWER
1500-1750 Watt Plant



(Item 20)

115/130 v. 60 cyc. AC. Push button start. Powered by a 4.5 HP Briggs engine. Combines compactness and easy portability with higher output for handling heavier starting loads. Ideal for operating oil burners, sump pumps, freezers, television; lights, communication systems, etc. Perfect for contractor's power tools. (Item 20). Wt. 146 lbs.
Factory Special Price **$279.50**

MASTER-LITE 2500 Watt Plant



(Item 21)

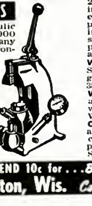
110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 HP Briggs engine, complete with all accessories. Includes control box, voltmeter, and handy plug-in power receptacle. An ideal plant for permanent or stand-by service. Wt. 225 lb. Reg. price $645.00
(Item 21) Factory Price **$329.50**
Dual Voltage 110/220 available for above plant for $30.00 additional.
3500 Watt Plant Push Button Start (Item 23) 115 v. 60 cyc. AC. Similar to above, but larger and 33% more capacity. Wt. 270 lbs. Reg. $760. Factory Price............**$379.50**
We make fully automatic controls to operate any of the above light plants. Write for details. **We make all sizes up to 25,000 Watts.**

MASTER AIR COMPRESSOR

Tank Tested up to 500 lbs. per sq. in.

COMPARE! This is the only compressor built with a NO RUST stainless steel tank. Safe up to 500 lbs. (Item 209a) High pressure type (4 c.f.m.) Large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, greasing, sand blasting, etc. Piston type 2" bore compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 2100 cu. in. cap. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed **SAFE**. Low factory prices. With ½ H.P. repulsion-induction 110 v. AC. heavy duty motor. Reg. $225. (Item 209a). Special Factory Price..... **$129.50**

9 TON HYDRAULIC PRESS

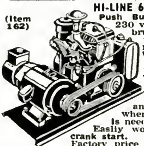


A tremendously powerful hydraulic press, capable of exerting 18,000 lbs. pressure. Pays for itself many times over—straightening bent connecting rods, king pins, crankshafts, axles, link pins and bars — or pushing out frozen bearings and bushings. Developed pressure under precise control and visible at all times on accurate gauge. Complete with both large and small anvils and jigs to straighten any kind of curve or bend. (Item 464) Wt. 110 lb. Actual list price $365. Our special close-out price.... **$69.50**

LESS THAN WHOLESALE

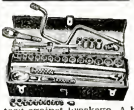
HI-LINE 6000 WATT PLANT

(Item 162)



Push Button Start 115-230 v. 60 cyc. A.C. A brute of a power plant with a rugged 14.6 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995. **With crank start.**
Factory price **$585.50**
Same plant, but **with self-starter, $645.00**
Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price **$345.00**

52 pc. SOCKET SET



Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 28 sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. A beautiful set of tools that will handle any job; in a **big** doghouse steel box. Wt. 17 lbs. (Item 205)
List price $62.90. Factory special.. **$27.95**

Variable Speed Selector

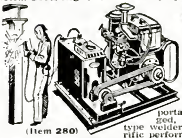
(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Employs reliable "trouble free" planetary system. No hydraulic power losses. Infinite range, smooth operation, easy installation. 3 sizes: ½-1 hp. 36 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs.; Reg. list $228, $252 and $352. Our prices ....
$79.50, $89.50 and $114.50

JET FLOW BLOWER

Tremendous air movement (1800 CFM) and quiet operation make this double inlet 10" turbine blower unbeatable for heating, cooling, drying and air conditioning. Ideal for attic or barn ventilation, converting gravity heating to forced air; spray booth exhausts, etc. Operates with any ¼, ⅓ or ½ HP motor. Oversized, long life bearings. Includes variable speed motor pulley and belt. Dimensions 19" ht x 18" x 16½". Outlet opening 13" x 11⅜". Wt. 45 lbs. Item 245. Reg. $54.50.
Factory Special............... **$27.50**
HEAVY DUTY ¼ HP motor for above **$16.95**
12" TURBINE BLOWER Similar to above, but larger with 2400 CFM capacity. Wt. 65 lbs. (Item 245a) Reg. $70.00. Factory Spec. **$34.50**

MASTER DC ARC WELDERS



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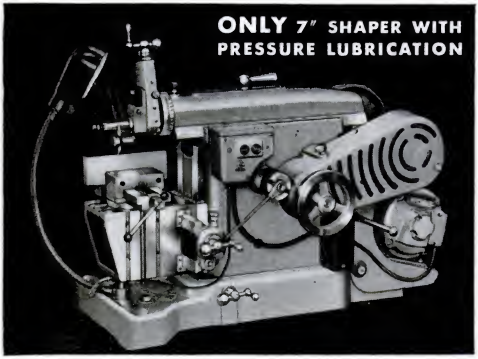

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